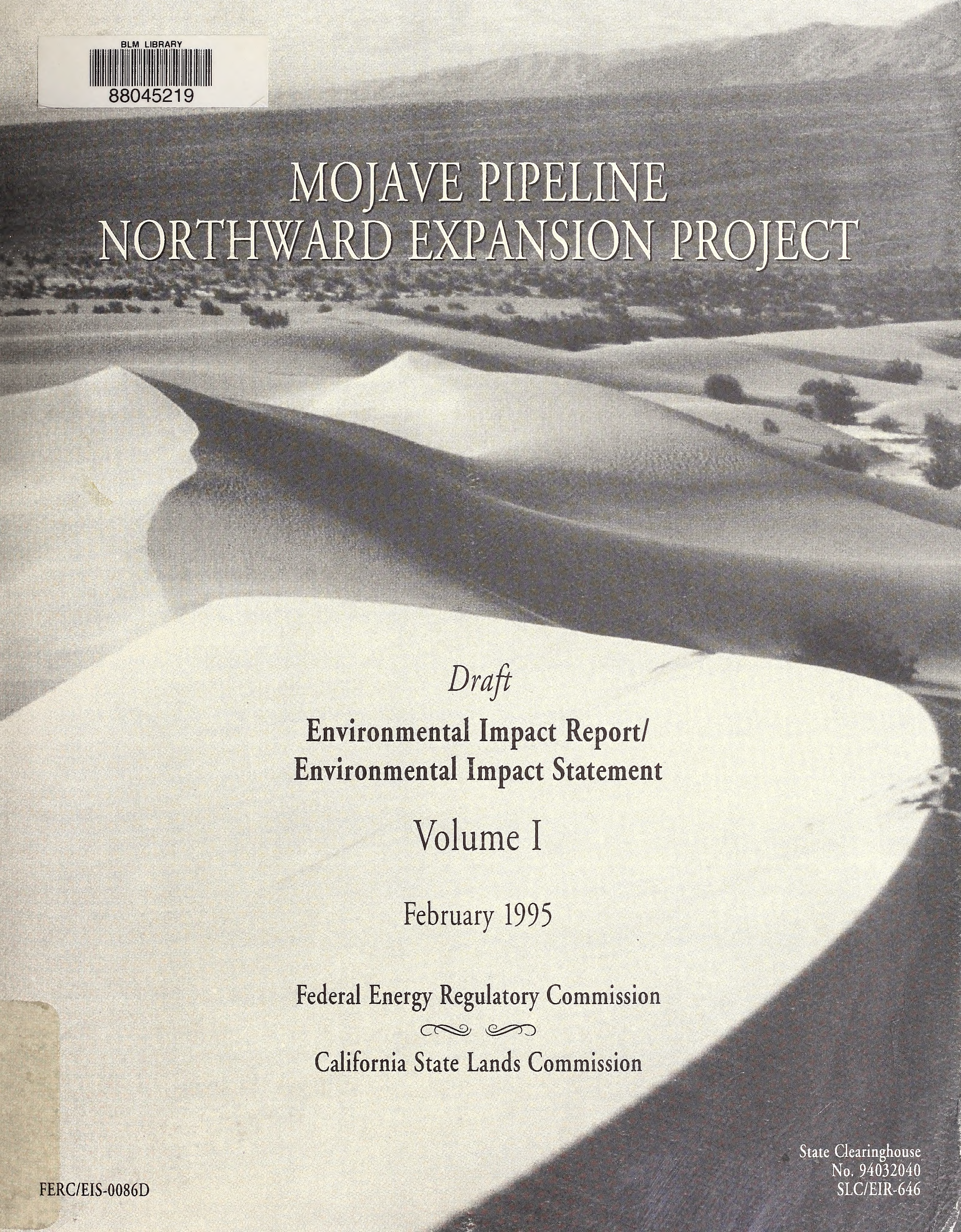
BLM LIBRARY
88045219



MOJAVE PIPELINE NORTHWARD EXPANSION PROJECT

Draft

**Environmental Impact Report/
Environmental Impact Statement**

Volume I

February 1995

Federal Energy Regulatory Commission

California State Lands Commission

State Clearinghouse
No. 94032040
SLC/EIR-646

FERC/EIS-0086D

BLM LIBRARY
RS 150A BLDG. 50
DENVER FEDERAL CENTER
P.O. BOX 25047
DENVER, CO 80225

ID88045219

TD
195
.P4
M653
1995
v.1

MOJAVE PIPELINE
NORTHWARD EXPANSION PROJECT
DRAFT
ENVIRONMENTAL IMPACT REPORT / ENVIRONMENTAL IMPACT STATEMENT

VOLUME I

Federal Energy Regulatory Commission
825 North Capitol Street, NE
Washington, DC 20426

California State Lands Commission
1807 - 13th Street
Sacramento, CA 95814

BLM LIBRARY
RS 150A BLDG. 50
DENVER FEDERAL CENTER
P.O. BOX 25047
DENVER, CO 80225

February 1995

FERC/EIS-0086D
FERC Docket
Nos. CP93-258-000 et al.

EIR 646
State Clearinghouse
No. 94032040

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION
AND
CALIFORNIA STATE LANDS COMMISSION

Mojave Pipeline Operating Company)

Docket Nos. CP93-258-000, et al.
CA Clearinghouse No. 94032040

TO THE PARTY ADDRESSED:

The staffs of the Federal Energy Regulatory Commission (FERC) and California State Lands Commission (SLC) have prepared this draft environmental impact report/environmental impact statement (EIR/EIS) on the natural gas pipeline facilities proposed by Mojave Pipeline Operating Company (Mojave) in the above dockets.

The draft EIR/EIS was prepared to satisfy the requirements of the National Environmental Policy Act and the California Environmental Quality Act. The staffs of the FERC and SLC believe, subject to public comment, that approval of the proposed project, with appropriate mitigation measures and receipt of necessary permits and approvals, has the potential to significantly impact the environment. The draft EIR/EIS includes an evaluation of the proposal.

The FERC and SLC staffs assessed the potential environmental effects of the construction and operation of the proposed Mojave Northward Expansion Project, which consists of between 660 and 681 miles of pipeline, depending on final project configuration, including the following facilities:

- A North Mainline about 290 miles long from near Bakersfield northward to Martinez.
- A Sacramento Mainline about 63 miles long from Ripon to southwest Sacramento.
- Shorter segments, which may include segments to Lindsay, Famoso, Coalinga, Kingsburg, Sanger, Livingston, Turlock, Ceres, Modesto, Tracy, Oakland, Antioch, Fremont, McFarland, Malaga, Madera, Fairmead, Ripon, Lathrop, Hunters Point, and San Francisco.
- A maximum of about 100 miles of pipeline loops on the existing Mojave Mainline, Mojave-Kern River East Side Lateral, and Mojave-Kern River Commonline.
- A total of 62,588 to 78,758 horsepower (hp) of compression at three new compressor stations in California at Amboy, Daggett, and either Famoso or Lindsay plus the addition of 24,470 hp of compression to Mojave's existing compressor station at Topock, Arizona.
- Either 55 or 58 new meter stations depending on the final project configuration.

The draft EIR/EIS has been placed in the public files of the FERC and SLC and is available for public inspection at:

Federal Energy Regulatory Commission
Division of Public Information
941 North Capitol Street NE, Room 3104
Washington, DC 20426
(202) 208-1371

California State Lands Commission
1807 - 13th Street
Sacramento, CA 95814
(916) 322-0354

Copies have been mailed to Federal, state, and local agencies, public interest groups, interested individuals, public libraries, newspapers, and parties to this proceeding.

A limited number of copies of the draft EIR/EIS are available from either:

Mr. Michael Boyle
Federal Energy Regulatory Commission
Environmental Project Manager
Office of Pipeline Regulation, Room 7312
825 North Capitol Street NE
Washington, DC 20426
(202) 208-0839

Ms. Mary Griggs
California State Lands Commission
Environmental Project Manager
1807 - 13th Street
Sacramento, CA 95814
(916) 322-0354

Any person wishing to comment on the draft EIR/EIS may do so. Written comments must reference Docket Nos. CP93-258-000, et al. Comments should be addressed to:

Office of the Secretary
Federal Energy Regulatory Commission
825 North Capitol Street, NE
Washington, DC 20426

California State Lands Commission
1807 - 13th Street
Sacramento, CA 95814
Attention: Ms. Mary Griggs

Comments should be filed as soon as possible but must be received no later than **March 27, 1995**, to ensure consideration prior to a FERC and SLC decision on this proposal. **A copy of any comments should also be sent to either Mr. Michael Boyle, FERC Environmental Project Manager, or Ms. Mary Griggs, SLC Environmental Project Manager at their respective addresses given above.**

Comments will be considered by the FERC and SLC but will not serve to make the commentor a party to the proceeding. Any person seeking to become a party to the proceeding must file a motion to intervene pursuant to Rule 214 of the FERC's Rules of Practice and Procedure (18 CFR 385.214).

In addition to asking for written comments, we invite you to attend any of the public meetings that will be held at the times and locations listed below. The meetings will be designed to provide you with more detailed information and another opportunity to offer your comments on the draft EIR/EIS. Those wanting to speak at the meetings can call the FERC and SLC Environmental Project Managers to preregister their names on the speakers' list. Those people on the speakers' list prior to the date of the meeting will be allowed to speak first. Priority will be given to people representing groups. A transcript of each meeting will be made so that your comments will be accurately recorded.

- **San Francisco, California**
  February 27, 1995: 3:00 pm to 7:00 pm

  Earl P. Mills Community Center
  100 Whitney Young Circle
  San Francisco, California

- **Livermore, California**
  February 28, 1995: 7:00 pm

  Junction Middle School
  298 Junction Avenue
  Livermore, California

- **Fresno, California**
  March 1, 1995: 7:00 pm

  Holiday Inn - Fresno Airport
  5090 E. Clinton Way @ Gateway
  Fresno, California

- **Barstow, California**
  March 2, 1995: 7:00 pm

  Barstow Holiday Inn
  1511 E. Main Street
  Barstow, California

Additional information about this project is available from Mr. Michael Boyle, FERC Environmental Review and Compliance Branch I, Office of Pipeline Regulation, at (202) 208-0839 or from Ms. Mary Griggs, SLC, at (916) 322-0354.

Robert C. Hight
Executive Officer
California State Lands Commission

Lois D. Cashell
Secretary
Federal Energy Regulatory Commission

MOJAVE NORTHWARD EXPANSION PROJECT
ENVIRONMENTAL IMPACT REPORT/ENVIRONMENTAL IMPACT STATEMENT
EXECUTIVE SUMMARY

INTRODUCTION

This Mojave Northward Expansion Project Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) was prepared jointly by the staffs of the California State Lands Commission (SLC) and the Federal Energy Regulatory Commission (FERC) in cooperation with the U.S. Bureau of Land Management (BLM). This EIR/EIS reports the results of our assessment of the environmental effects of constructing and operating the proposed natural gas pipeline system expansion. This EIR/EIS fulfills the requirements of the California Environmental Quality Act as well as the National Environmental Policy Act.

This draft EIR/EIS was issued in February 1995, initiating a 45-day comment period. Approximately 750 copies were sent for comment to various Federal, state, and local government agencies, elected officials, environmental groups, local libraries, private citizens, and intervenors to the FERC's proceeding. In addition, approximately 1,200 copies of this Executive Summary were distributed to property owners who would be directly affected by the proposed project and various other local officials, public and private groups, and private citizens not directly affected. Comments on this draft EIR/EIS received by letter or at the four planned public hearings will be addressed in the final EIR/EIS. Individuals receiving only this Executive Summary may request a copy of the final EIR/EIS while supplies last from:

Mr. Michael Boyle
Federal Energy Regulatory Commission
825 North Capitol Street NE, Room 7312
Washington, DC 20426
(202) 208-0839

Ms. Mary Griggs
California State Lands Commission
1807 - 13th Street
Sacramento, CA 95814
(916) 322-0354

The final EIR/EIS will also be available for review at the various SLC and BLM offices in the project area as well as at the SLC office in Sacramento and the FERC office in Washington.

PROPOSED ACTION

The Mojave Pipeline Operating Company (Mojave) proposes to expand its existing pipeline system to deliver 475 million cubic feet of natural gas per day to customers in the San Joaquin Valley, Sacramento, and the San Francisco Bay Area. The project's purpose is to provide competition for the existing utility service and to offer firm, reliable, natural gas transportation service from the southwest to primarily cogeneration facilities and large industrial plants. The existing Mojave pipeline, completed in 1992, provides interstate natural gas transportation service from Mojave's Topock Compressor Station in western Mojave County, Arizona, across San Bernardino County, California, to its terminus near Bakersfield in Kern County.

The proposed project, shown in Figure ES-1, is designed to serve a core group of customers and one of two alternative sets of additional customers. The facilities to be built would depend on which set of additional customers would be served. The project would include up to 453 miles of

THIS PAGE INTENTIONALLY BLANK

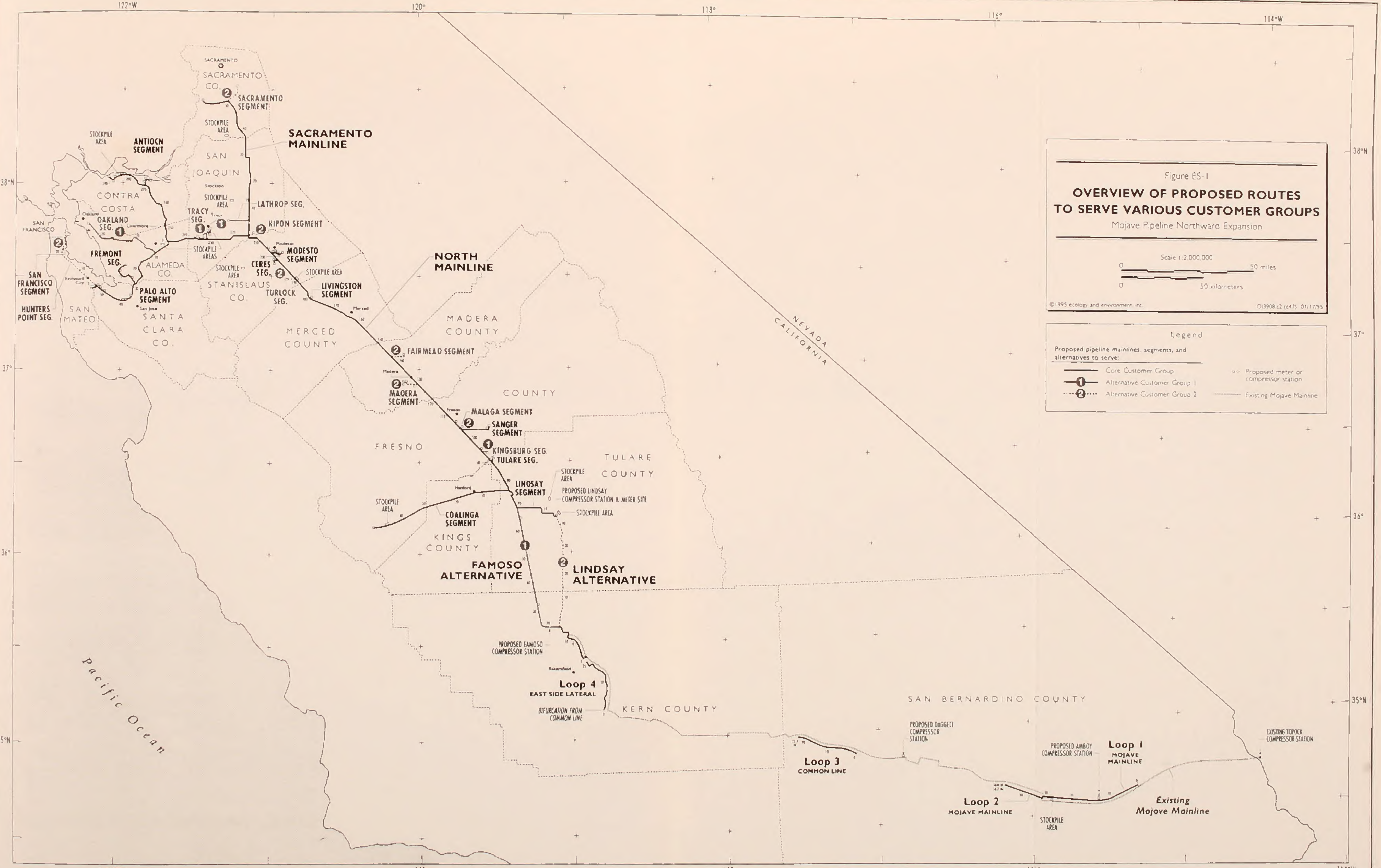


Figure ES-1

OVERVIEW OF PROPOSED ROUTES TO SERVE VARIOUS CUSTOMER GROUPS

Mojave Pipeline Northward Expansion

Scale 1:2,000,000
0
50 miles
0
50 kilometers
©1995 ecology and environment, inc.
OJ3908.c2 (c47) 01/17/95
Legend
Proposed pipeline mainlines, segments, and alternatives to serve:
Core Customer Group
① Alternative Customer Group 1
② Alternative Customer Group 2
Proposed meter or compressor station
Existing Mojave Mainline
122°W
120°
118°
116°
114°W
122°00'W
38°N
37°
36°
35°N
Sacramento
SACRAMENTO CO.
SACRAMENTO SEGMENT
STOCKPILE AREA
SACRAMENTO MAINLINE
STOCKPILE AREA
ANTIOCH SEGMENT
SAN JOAQUIN
Stockton
STOCKPILE AREA
LATHROP SEG.
TRACY SEG.
Tracy
RIPON SEGMENT
CONTRA COSTA
OAKLAND SEG.
Oakland
Livermore
SAN FRANCISCO
FREMONT SEG.
ALAMEDA CO.
STOCKPILE AREAS
STOCKPILE AREA
Modesto
MODESTO SEGMENT
CERES SEG.
STOCKPILE AREA
STANISLAUS CO.
TURLOCK SEG.
LIVINGSTON SEGMENT
Merced
SAN FRANCISCO SEGMENT
Redwood City
PALO ALTO SEGMENT
San Jose
HUNTERS POINT SEG.
SAN MATEO
SANTA CLARA CO.
NORTH MAINLINE
MADERA COUNTY
MERCED COUNTY
FAIRMEAO SEGMENT
Madera
MAOERA SEGMENT
COUNTY
Fresno
MALAGA SEGMENT
SANGER SEGMENT
FRESNO
KINGSBURG SEG.
TULARE SEG.
TULARE COUNTY
STOCKPILE AREA
LINOSAY SEGMENT
PROPOSED LINDSAY COMPRESSOR STATION & METER SITE
STOCKPILE AREA
Hanford
STOCKPILE AREA
COALINGA SEGMENT
KINGS COUNTY
FAMOSO ALTERNATIVE
LINDSAY ALTERNATIVE
PROPOSED FAMOSO COMPRESSOR STATION
Bakersfield
Loop 4
EAST SIDE LATERAL
BIFURCATION FROM COMMON LINE
KERN COUNTY
NEVADA
CALIFORNIA
Pacific Ocean
SAN BERNARDINO COUNTY
PROPOSED DAGGETT COMPRESSOR STATION
Loop 3
COMMON LINE
PROPOSED AMBOY COMPRESSOR STATION
Loop 1
MOJAVE MAINLINE
Loop 2
MOJAVE MAINLINE
STOCKPILE AREA
Existing Mojave Mainline
EXISTING TOPOCK COMPRESSOR STATION

new, large-diameter pipelines, up to 228 miles of smaller-diameter pipelines, 55 to 58 meter stations, three new compressor stations, and modifications to the existing Topock Compressor Station. We analyzed all of Mojave's proposed facilities including the facilities to serve both groups of additional customers even though all of these facilities would not be built. Mojave proposes to bury its pipeline within or adjacent to Southern Pacific railroad right-of-way for most of the route between Bakersfield and Tracy and within existing roads for most of the lateral segments. The proposed loops of Mojave's system would be within or adjacent to its existing right-of-way.

ALTERNATIVES

We considered a full range of reasonable alternatives including: no action or postponing action; using other existing pipeline systems in the same geographic area instead of the proposed project; and routing the pipeline differently.

On November 18, 1994, the FERC issued a Preliminary Determination on Nonenvironmental Issues to Mojave. In the Preliminary Determination, the FERC indicated that authorizing the construction and operation of Mojave's proposed facilities would be in the public convenience and necessity under Section 7(c) of the Natural Gas Act. Final action on the Certificate will not occur until after the environmental review is complete and all environmental matters have been addressed.

If the FERC and SLC were to deny or postpone approving Mojave's application, the potential users of these facilities would not benefit from pipeline-to-pipeline competition, and it could limit public access to natural gas reserves from the Rocky Mountain and Southwest production areas. Although denial or postponement of the FERC Certificate and SLC permit would avoid the environmental impact addressed in this EIR/EIS, the market demand could stimulate pipeline construction by other entities. It would be purely speculative and, therefore, beyond the scope of this EIR/EIS to attempt to predict what actions might be taken by policy makers or end-users in response to the no-action alternative.

We were unable to identify a reasonable system alternative to Mojave's project. We considered the existing systems operated by either the Southern California Gas Company (SoCal Gas) in southern California or the Pacific Gas and Electric Company (PG&E) in Central and Northern California. Although the improvements to these systems that would be required to serve the same market Mojave proposes to serve would require less construction and therefore result in less short-term impact, use of these existing systems would not meet the project objectives of increased reliability of service or pipeline-to-pipeline competition.

In the Mojave Desert, alternatives were evaluated when the original Mojave project was proposed. Because looping the existing pipeline in this area would disturb primarily the area already disturbed by the construction of the original project, extending the recovery period by about 5 years, the proposed route is the environmentally preferred alternative in this sensitive area.

In the Central Valley, we initially evaluated five major alternative routes between Bakersfield and Tracy: the San Joaquin Valley Pipeline route; the Interstate Highway 5 corridor; the Atkinson, Topeka, and Santa Fe Railroad right-of-way; the Cross Valley route; and the PG&E pipeline route. These alternative routes are shown in figure 3.3.2-1 in section 3.

The San Joaquin Valley Pipeline was proposed but never built, and the expansion of the PG&E pipeline was recently completed. Environmental impact documents prepared for both projects evaluated alternative routes and concluded that the projects could be built in an environmentally acceptable manner.

Using these documents, we determined that the impact of the Mojave Northward Expansion Project would be similar; however, both the PG&E and San Joaquin Valley pipelines were designed to serve different markets than the Mojave Northward Expansion Project's and would require more miles of pipeline construction to serve Mojave's proposed markets as would use of the Interstate Highway 5 corridor. The Cross Valley route, which is the shortest distance through the Central Valley, would adversely affect operations through many miles of prime agricultural land. The Atkinson, Topeka and Santa Fe Railroad would have similar impacts as the proposed route but would be farther from proposed customers, thus requiring more lateral construction and attendant impact. Because all would require more miles of pipeline construction without a significant reduction in environmental impact, we concluded that the route as proposed is the environmentally preferable alternative through the Central Valley. A bypass around Fresno was evaluated, and, while different resources would be affected, the greater amount of pipeline construction required to serve potential customers would negate any potential benefit.

In the San Francisco Bay Area, several alternative routes were identified to increase the use of existing rights-of-way and reduce potential adverse effects. Five alternative routes were screened using 15 different environmental indicators. These alternative routes are shown in figure 3.3.3-1 in section 3. Three alternative routes were carried forward for further analysis: the Tracy to Antioch Southern Pacific Railroad, San Joaquin Valley Pipeline, and I-680 Southward Alternative Routes. The San Joaquin Valley Alternative Route is buildable but not environmentally preferable. The I-680 Corridor Southward Alternative Route does not appear to be environmentally preferable.

We determined that the Tracy to Antioch Southern Pacific Railroad Alternative Route is environmentally superior to the corresponding segment of the proposed route, and we recommend its adoption.

To address a number of local route concerns, in consultation with several planning and public works agencies and other interested parties, we identified 12 minor route variations. These variations are described in this document. Whether any are environmentally preferable to the proposed route has not been determined, and we are soliciting public input as well as engineering and cost evaluations from Mojave.

PUBLIC SCOPING AND AREAS OF CONCERN

Federal, state, and local agencies and the public were invited to participate in determining the scope of this document. A "Notice of Preparation/Intent to Prepare a Joint Draft Environmental Impact Report/Statement for the Proposed Mojave Northward Expansion Project and Request for Comments on Environmental Issues" was mailed to landowners, Federal, state, and local government agencies including cities and counties along the route, and other interested groups and organizations on April 12, 1994. We held four public meetings geographically dispersed throughout the proposed project area (Palo Alto, Livermore, Fresno, and Barstow) and recorded the comments and concerns expressed at the meetings or received by letter. The most common concerns were:

- The specific route of the pipeline and its impact on land use, e.g., how future use of the land and property values would be affected.

- The safety of the pipeline in residential areas.

Other concerns were:

- Geologic hazards such as earthquakes.

- The effects on rare plant and animal species and other natural resources.

- How the project would comply with the specific permits and requirements of various government agencies.

We addressed all of these concerns in this draft EIR/EIS.

The public is invited to comment on this draft either in writing to the lead agencies or at the four scheduled public hearings. The public comment period will end on March 27, 1995. We will address all comments received before publishing the final EIR/EIS.

MAJOR IMPACT CONCLUSIONS

We have analyzed the significant impact of the proposed project and recommended additional mitigation measures as reported in section 5. Table ES-1 is a quantitative summary of the potentially significant impact of the Mojave Northward Expansion Project and indicates whether the impact would remain significant after all of the Mojave-proposed and agency-recommended mitigation measures are implemented. Most of the significant impact would occur during the construction phase of the project but would be reduced to less than significant levels by mitigation. The only construction-related impact that would remain significant after mitigation would be construction equipment emissions and fugitive dust exceeding air district thresholds. The construction jobs created would be beneficial to local communities.

The only significant impact of the operation of the proposed project that would remain significant after mitigation would be effects of geologic hazards on the pipeline. The tax revenues accrued would be beneficial to local communities.

With the mitigation included as part of the proposed project and the additional mitigation measures we have recommended in this EIR/EIS, the project would not significantly affect wildlife, vegetation, surface waters, cultural resources, public interest areas, air quality, traffic, or noise-sensitive areas.

Table ES-2 at the end of this Executive Summary summarizes, by resource type, the primary impact and the mitigation measures either proposed by Mojave as part of the project or recommended by agencies to further reduce the impact. The impact is fully described in section 5, and section 7 lists all of the proposed and recommended mitigation measures. The environmental effects are further summarized below.

Geology and Soils

Geologic hazards could affect some segments of the proposed pipeline. The proposed route includes 20 crossings of potentially active faults; two of these crossings are in populated areas. We have recommended detailed geotechnical evaluations to determine site-specific mitigation measures, but in heavily populated areas, the potential hazard would remain significant after mitigation.

The proposed route crosses about 43 miles of landslide-prone terrain, and mitigation might not completely eliminate the potential for pipeline construction to increase the slope instability in these areas. We have, therefore, recommended geologic hazard assessments to further evaluate landslide

TABLE ES-1

Summary of Potentially Significant Impact of the Mojave Northward Expansion Project (Core Project and Additional Facilities to Serve Alternative Customers Groups 1 and 2)

Resource Area and Impact	Number	Would Remain Significant After Mitigation? a/
Geology		
Miles of potential blasting (nearsurface bedrock)	34	No
Number of potential active faults crossed	20	Yes
Miles of potential seismic ground shaking crossed	223	No
Miles of potential soil liquefaction crossed	41	No
Miles of potential subsidence and hydrocompaction crossed	41	No
Miles of potential landslides crossed	43	Yes
Miles of potential soft clay settlement crossed	4	No
Number of known paleontologic resource site crossed	6	No
Soils		
Miles of wet soils crossed	0	No
Miles of low-fertility soils crossed	370	No
Miles of soils crossed on steep slopes	133	No
Miles of erosion- or destabilization-prone soils crossed	300	No
Miles of saline soils crossed	239	No
Miles of sodic soils crossed	196	No
Water Resources		
Number of navigable water crossings	2	No
Number of major river and stream crossings	285	No
Number of public water supplies crossed	0	No
Number of public water supply watersheds crossed	1	No
Vegetation		
Acres of foothill woodlands affected	40	No
Acres of chenopod scrub communities cleared	41	No
Acres of nonnative grasslands cleared	872	No
Acres of wetlands crossed	68	No
Acres of riparian woodlands affected as wetlands	11	No
Acres of agricultural croplands, orchards, and vineyards disturbed	2,128	No
Wildlife and Aquatic Resources		
Miles of sensitive species habitat crossed	770	No
Number of water bodies crossed containing viable fisheries	22	No
Special Status Species		
Number of Federal- or state-listed threatened or endangered species potentially occurring in project area	35	No

TABLE ES-1 (cont'd)

Resource Area and Impact	Number	Would Remain Significant After Mitigation? a/
Land Use, Transportation, Recreation, and Visual Resources		
Acres of land temporarily disturbed	6,276	No
Acres of agricultural land	2,335	No
Acres of range/open land	2,425	No
Acres of residential land	100	No
Acres of industrial/commercial and other land affected	1,416	No
Number of residences within 50 feet of the construction right-of-way	2,219 - 2,913	No
Number of Federal and state highways crossed	54	No
Miles of recreational and public interest areas crossed	30	No
Socioeconomics		
None	0	No
Cultural Resources		
Number of NRHP-listed or recommended eligible sites in area of potential effect	13	No
Number of sensitive Native American sites in area of potential effect	25	No
Air Quality and Noise		
Number of new compressor stations (New Source review)	4	No
Number of compressor stations modified (PSD review)	1	No
Number of exceedences of air district's significant unavoidable impact emission thresholds under CEQA	11	Yes
Number of compressor stations operating above 55 dB(A)	1	No
Reliability and Safety		
Number of fatalities per 1,000 miles of pipeline per year	0.008	No
Number of areas with potential soil contamination	24	No
Number of areas with potential groundwater contamination	7	No

---

a/ Mitigation proposed by Mojave as part of the project plus additional mitigation measures recommended in this EIR/EIS.

potential in the Coast Ranges and other areas with sloping terrain. Although the pipeline has been routed to avoid some areas of extensive landsliding, given the widespread occurrence of landslides in some areas of the Coast Ranges, further rerouting to avoid landslide-prone areas might be required.

Mitigation to prevent increased soil erosion rates or reduced soil productivity have been incorporated in the project. Any and all other effects on geologic resources including paleontologic resources as well as geologic hazards and soils would not be significant or would be mitigated to less than significant levels by the proposed or recommended measures.

Water Resources

Mojave proposes to directionally drill under major river crossings and would use the FERC staff's Wetland and Waterbody Construction and Mitigation Procedures (appendix C) to reduce the level of impact on other water resources. Any and all effects on groundwater and surface water resources would be less than significant or would be mitigated to less than significant levels by the proposed or recommended measures.

Vegetation

The use of existing rights-of-way for about 80 percent of the proposed route minimized the amount of vegetation and therefore habitat that would be disturbed during construction. Most vegetative communities would recover in 1 to 3 years. In the Mojave Desert, the proposed looping of existing pipeline (i.e., installing new pipeline parallel to existing pipeline) would significantly affect about 697 acres of Mojave desert scrub, which provides habitat for the desert tortoise, because the desert scrub community would take 20 to 50 years to recover. This impact would be reduced by restoring disturbed areas and providing compensation acreage.

Construction through vernal pools associated with nonnative grasslands in the Central Valley could destroy the hardpan and permanently modify the hydrology unless the soil layers are carefully restored. Up to 1.6 acres of vernal pools could be disturbed along the proposed route. Because of the rarity of these pools, their hydrology's sensitivity to disturbance, and the presence of four species of vernal pool fairy shrimp that were recently listed by the U.S. Fish and Wildlife Service (FWS) as federally threatened, the impact on vernal pools that could not be avoided by rerouting would be considered long-term, if not permanent. By restoring affected areas and providing compensation acreage, this impact would be reduced to less than significant.

Only a 10-foot-wide corridor in the permanent right-of-way would be kept free of trees through wooded wetlands; therefore about 1.41 acres in the Central Valley and up to 1.8 acres in the Coast Ranges-San Francisco Bay Area would be permanently changed from wooded to herbaceous or shrub vegetation.

Any and all other effects on vegetation and wetlands would be less than significant or would be mitigated to less than significant levels by the proposed or recommended measures.

Wildlife and Aquatic Resources

Any and all effects on wildlife and fish would be less than significant or would be mitigated to less than significant levels by the proposed or recommended measures.

Special Status Species

In consultation with the FWS and California Department of Fish and Game (DFG), we determined that 35 special status species occur in or near the proposed right-of-way and, therefore, could be adversely affected by the proposed project. This number could be reduced by using the FERC and SLC staffs' preferred alternative route in the San Francisco Bay Area, the Tracy to Antioch Southern Pacific Railroad Route. The impact on all of these species would be mitigated to less than significant levels. This impact will be addressed in our Biological Assessment and in the Biological Opinions to be issued by the FWS and DFG.

Any and all other effects on threatened and endangered species would be less than significant or would be mitigated to less than significant levels by the proposed or recommended measures.

Land Use, Transportation, Recreation, Visual Resources, and Socioeconomics

For the life of the project, approximately 630 acres of land would be maintained as permanent right-of-way. Approximately 27 of the 630 acres are walnut and almond orchards, and the replanting of these trees would be prohibited during the life of the project to facilitate maintenance and aerial surveillance. This impact would be long-term but minor compared to the available agricultural land.

Because very few heavily wooded areas are crossed by the proposed route, the permanent visual impact of a cleared right-of-way would be limited; grassy areas would revegetate quickly. In urban areas, some long-term or permanent visual impact would occur along existing tree-lined streets such as Trimble Road in Santa Clara where the proposed pipeline would be constructed under the roadway for 1 mile, but Mojave would replace residential landscaping. We have recommended that Mojave give special consideration during construction to preserving mature vegetation and saving trees wherever possible.

No conflicts with county land use plans were identified; however, minor route variations to avoid localized conflicts in 12 areas were identified, and we are seeking public comment on them.

Any and all other effects on land use, transportation including traffic, recreation and public interest areas, visual resources, and socioeconomics would be less than significant or would be mitigated to less than significant levels by the proposed or recommended measures.

Cultural Resources

The FERC, SLC, and BLM would ensure that the proposed project would comply with Section 106 of the National Historic Preservation Act. As the lead Federal agency, the FERC is responsible for officially determining eligibility for the National Register of Historic Places and project effects in consultation with the State Historic Preservation Office, SLC, and BLM. This consultation is currently in progress. If it is determined that the proposed project would affect historic resources, site-specific treatment plans would be required.

Any and all effects on cultural resources including historic and Native American sites would be less than significant or would be mitigated to less than significant levels by the proposed or recommended measures.

Air Quality and Noise

Compressor station emissions would be mitigated to less than significant levels as part of the permitting process. Increased dust and emissions from construction vehicles and activities are predicted to exceed the following local air pollution control or management districts' significant unavoidable impact thresholds for emissions from construction-related equipment and activities even after mitigation as follows:

- Mojave Desert District — CO, NO_x, and PM10
- San Joaquin Valley District — CO, VOC, NO_x, and PM10
- Sacramento District — PM10
- Bay Area District — VOC, NO_x, and PM10.

Other effects on air quality and noise would be less than significant or would be mitigated to less than significant levels by the proposed or recommended measures.

Reliability and Safety

The proposed project would be constructed in compliance with all applicable safety standards. A number of additional safety features would be incorporated in the project such as radiographic inspection of all welds and burying the pipeline deeper in some locations. To date, Mojave has never had a reportable incident. Effects on public safety would be less than significant or would be mitigated to less than significant levels by the proposed or recommended measures.

Cumulative Impact

Initially, a list of approximately 220 projects identified through the State Clearinghouse Data Base were reviewed to determine whether they could potentially cause cumulative impact when combined with the impact of the proposed project. Subsequently, 18 projects that could occur in the vicinity of Mojave's proposed project during the same time frame were reviewed. No significant cumulative impact is expected.

ENVIRONMENTAL STAFF CONCLUSIONS

Unless specifically identified otherwise, the conclusions and recommendations presented herein are those of the staffs of the FERC and SLC. This EIR/EIS presents the results of our evaluation of the potential environmental impact associated with the construction of the proposed natural gas transmission facilities. On the basis of information provided by Mojave and further developed by route inspections, literature searches, route variation analyses, and contacts with Federal, state, and local agencies and the public, we have determined that the proposed project would result in a limited adverse environmental impact and would be subject to a determination of overriding considerations under the California Environmental Quality Act for its approval because of certain significant unavoidable impact that might remain after mitigation.

On the basis of the information contained in this document, we conclude that, if the proposed project is constructed and operated in accordance with the mitigation recommendations, it would be an environmentally acceptable action. Several important factors were considered carefully in making this determination. Our analysis indicated that most of the impact would occur during construction of the proposed facilities. A major consideration was the extent to which the proposed route uses existing railroad, surface road, utility, and pipeline rights-of-way. Of the maximum 681 miles of proposed route, approximately 80 percent is in or adjacent to these existing rights-of-way. This use of existing rights-of-way significantly minimizes environmental impact. Additionally, the FERC staff has developed, in conjunction with other Federal agencies, a clearly defined set of construction procedures for wetland and waterbody crossings that would be used to significantly reduce the impact of pipeline construction on these resources. The FERC staff has also developed an erosion control, revegetation, and right-of-way maintenance plan that Mojave would use for construction in upland areas. The FERC and SLC would require that ongoing consultations with the DFG, FWS, BLM, and State Historic Preservation Office be completed before Mojave can begin construction.

The staff is responsible for identifying any significant environmental impact so that it can be considered by the FERC and SLC in deciding whether to approve the project. As part of the analysis, specific mitigation measures were developed that the staff believes would be appropriate and reasonable because they would significantly reduce the environmental impact that would result from construction of the project. Where additional studies, plans, surveys, or field investigations are recommended, any significant impact that is identified would be either avoided or mitigated to a nonsignificant level. The staff's present determination of environmental acceptability would, therefore, be unaffected by the outcome of the recommended studies, which typically result in additional site-specific mitigation and further reduction of impact. The staff will recommend that all mitigation measures herein be attached as conditions to any Certificate issued by the FERC and to any approval issued by the SLC. The FERC and SLC would ensure compliance with the mitigation measures incorporated in this EIR/EIS through the adoption of an environmental inspection and mitigation monitoring plan for the project.

TABLE ES-2

Summary of Impact and Mitigation Measures

Impact	Mitigation Measures a/	Significant After Mitigation?
GEOLOGIC RESOURCES		
Pipeline or aboveground facility ruptures or failures that threaten public safety or worsen existing unfavorable geologic conditions.	Prepare Geologic Hazards Mitigation Plan for sites of geologic hazards listed in table 5.1.2-1 to be reviewed and approved by FERC and SLC (ARM 14).	Yes, in specific locations
Blasting — Effects on slopes, structures, wells, paleontologic resources, and indirectly on nearby residents or threatened and endangered species caused by ground vibrations due to blasting.	Obtain all necessary permits and authorizations (U.S. Bureau of Alcohol, Tobacco and Firearms [27CFR55]; OSHA [29CFR1910.109-1926.914]);use flagpersons on roads near blasting sites to control traffic; use matting to protect property; notify nearby residents; blast only during daylight hours (MPM 106).	No
Seismic Faults — Pipeline rupture due to surface fault displacement.	Implement some or all of the following standard industry measures: align route to cross fault at right angle; bury pipeline as shallow as possible; place pipe in wide V-shaped trench with light-weight granular backfill; place pipe inside larger pipe where fault crossings are bored; increase pipe wall thickness; place pipe on structural supports to allow pipe to remain in place while supports are displaced laterally; install automatic shut-off valves on both sides of active fault crossing (MPM 7).	Yes, in populated areas
Ground Failure Due to Liquefaction, Subsidence, or Hydrocompaction — Risk of rupture from overburden pressure if subsidence and loss of bearing cause loss of support; bending and weakening of pipeline along slopes due to flow failures; hazards to pipeline integrity due to lateral spreading.	Implement some or all of the following standard mitigation measures: compact soils in place; replace soils with gravel; install stone column supports or support pipe on deep foundations; use grouting; bury pipe below liquefiable soils; reroute around liquefiable areas; install automatic shutoff valves (MPM 9).	No
Ground Failure Due to Collapsible Soils — Pipeline failure due to increased moisture content.	Implement some or all of the following standard mitigation measures: remove collapsible soils; construct deep foundations to bypass collapsible soils; precollapse soils prone to hydrocompaction by wetting (MPM 10).	No
Landslides — Displacement or rupture of pipeline due to slope failures caused by landslides.	Implement some or all of the following standard industry mitigation measures: avoid landslide prone areas; conduct preconstruction geologic hazard assessment to identify, locate, and evaluate landslide hazards in the Coast Ranges; bury pipe deeper than slide zone; stabilize landslide by grading or other methods; design pipeline crossings to minimize damage from mass movement; use automatic shutoff valves in landslide prone areas (MPM 11).	Yes

---

a/ The FERC and SLC staffs will recommend to their respective Commissions that their additional mitigation measures (ARMs = agency-recommended measures) be included as specific conditions to any approving Certificate issued for Mojave's project. The staffs will also recommend that Mojave be required to implement the mitigation measures that Mojave has proposed as part of the project (MPMs = Mojave-proposed measures) unless specifically modified by other Certificate conditions.

TABLE ES-2 (cont'd)

Impact	Mitigation Measures a/	Significant After Mitigation?
Soft Clays (Bay Mud) — Long-term settlement of pipeline due to disturbance and weakening of Bay Mud or placing new fill over Bay Mud during construction.	Implement some or all of the following standard mitigation: reroute pipeline; design flexible pipeline; replace Bay Muds with granular materials; place pipeline on piles (MPM 12).	No
Mineral Resources — Hazards created by lack of adequate clearance and access for well workover equipment.	Coordinate with field operations managers of existing or abandoned oil or gas wells near pipeline to ensure that construction does not create hazards and that adequate clearances and access for well workover equipment are maintained (MPM 13).	No
Paleontologic Resources — Modification of fossils by construction or indirectly by project-related erosion; other indirect effects such as unauthorized fossil collection.	Implement some or all of the following standard mitigation measures: conduct preconstruction survey of areas of high paleontologic sensitivity (ARM 15); avoid significant fossil sites if possible or recover fossil materials; monitor all excavations in areas of high sensitivity and spot-check areas of moderate sensitivity; prepare Paleontologic Resource Management Plan (ARM 16).	No
SOILS		
Increased loss of topsoil and other erosion due to construction.	Follow measures specified in FERC's Erosion Control, Revegetation, and Maintenance Plan in appendix A (MPM 14); employ environmental inspectors to ensure compliance with Plan (MPM 5); revegetate according to the Project Revegetation Requirements in appendix B (ARM 24).	No
Reduced soil productivity due to soil compaction by heavy equipment, erosion, and mixing of topsoil and less productive subsoils.	Segregate topsoil from subsoil; loosen compacted soils by ripping or chiseling, or plow in a "green manure" crops such as alfalfa (MPM 14).	No
Reduced agricultural productivity due to damage to drainage tiles; interference with machinery by large stones brought to the surface during trenching.	Identify locations of existing drainage tiles; repair all drainage tiles damaged during construction to their original condition or better; remove stones larger than 4 inches from all segregated topsoil (MPM 14).	No
Establishment of noxious weeds where none or few existed; increased erosion and loss of habitat due to revegetation failure.	Consult with erosion control and revegetation specialists to develop site-specific plans to address potential sensitive areas (MPM 14).	No
Slumping and rutting in wet or saturated soils.	Halt construction when rainfall or flooding causes saturated soils; when Federal agencies stop construction on public lands, stop similar activities on nearby land (ARM 17).	No
Increased sedimentation from erosion during pipeline construction and operation.	Construct temporary slope breakers where needed to direct outfall from temporary slope breakers to appropriate energy - dissipating devices; use sediment barriers at the base of slopes adjacent to road or waterbody crossings where vegetation has been disturbed; use trench breakers on all slopes adjacent to water bodies and/or wetlands; and complete final clean-up and installation of permanent erosion control measures within 10 days after the trench is backfilled (MPM 14).	No

TABLE ES-2 (cont'd)

Impact	Mitigation Measures a/	Significant After Mitigation?
Increased erosion due to revegetation failure.	Remove construction debris from ROW unless otherwise instructed by landowner; construct permanent slope breakers; apply fertilizer and soil-pH-modifying agents as recommended by local soil conservation authorities; prepare seedbed in disturbed areas and seed in accordance with written recommendations of local soil conservation authorities on seeding mixes, rates, and dates; seed slopes steeper than 33% immediately after final grading; seed right-of-way within 6 working days of final grading; develop procedures to prevent the introduction of noxious weeds and soil pests (MPM 14); use seed mixes specified in Project Revegetation Requirements in appendix B (ARM 24); mulch all dry sandy sites and slopes >8% with straw or hay at 2 tons/acres and anchor mulch; use jute thatching or bonded fiber blankets on banks of waterbodies to stabilize seeded areas (MPM 14).	No
WATER RESOURCES		
Modification of aquatic habitat, increased sedimentation and turbidity, decreased dissolved oxygen concentration, stream warming, and releases of chemical and nutrient pollutants.	Follow measures specified in the FERC staff's Erosion Control, Revegetation, and Maintenance Plan in appendix A (MPM 14) and Wetland and Waterbody Construction and Mitigation Procedures in appendix C (MPM 20) for wetlands and riparian areas; assign one environmental inspection team to each construction spread (ARM 7). File with FERC and SLC a site-specific construction plan for all directional drilling sites (ARM 18). File with FERC and SLC an open-cut crossing plan for each waterbody listed in table 5.3.3.2-1 if directional drilling of the waterbody is unsuccessful (ARM 19).	No
Blasting — Adverse effects on groundwater quality or supply for bedrock-supplied private or irrigation wells.	Provide temporary source of water; repair, replace, or restore affected wells to former capacity if groundwater supply is adversely affected (MPM 21). File with FERC a Groundwater Monitoring Plan where blasting might be required (ARM 21).	No
Potential long-term contamination hazard to shallow aquifers from spills and leaks during refueling of vehicles and storage of fuel, oil, and other equipment-related fluids during construction.	Restrict the locations of refueling and storage facilities as required by the FERC staff's Wetland and Waterbody Construction and Mitigation Procedures (Procedures) (MPM 22); respond to spills as required by the Spill Prevention, Containment and Control Plan (SPCC) (MPM 16); update the SPCC Plan to identify the types and quantities of fuels, lubricants, and other hazardous materials stored during construction and to comply with the Procedures (ARM 20).	No
Establishment of new migration pathways for groundwater supplying springs or wetlands by alteration of natural soil strata.	Use natural backfill to fill trench; construct trench breakers (water diversion dams) along trench where nonnative backfill is used (MPM 17).	No
Reduced volume of groundwater available to existing users if overdrafting occurs during withdrawal for hydrostatic testing due to ongoing water shortages in project area.	Coordinate groundwater withdrawals with local water districts and private irrigation well owners (MPM 18).	No
Adverse effects on surface water or groundwater from disposal of shallow groundwater identified as poor quality or potentially contaminated during trench dewatering.	Predischarge testing and proper disposal as required by NPDES and Waste Discharge Requirements permits (MPM 19, 22).	No

TABLE ES-2 (cont'd)

Impact	Mitigation Measures a/	Significant After Mitigation?
Degradation of surface water quality and effects on aquatic life from increased sediment loads in streams caused by surface runoff and erosion.	Prepare and implement Storm Water Pollution Prevention Plan that indicates procedures to keep sediment-laden runoff from entering streams or storm drains (MPM 23).	No
Adverse effects on aquatic life and other downstream users from reduced streamflows where water is withdrawn for hydrostatic testing.	Obtain permits and purchase agreements to withdraw water at a rate that will maintain adequate downstream flow (MPM 20).	No
Streambank erosion and downstream sedimentation caused by discharge of hydrostatic test water.	Control rate of discharge to prevent erosion and downstream sedimentation as required by the FERC staff's Procedures; use a multibag filter to remove solids before discharging test water; obtain approval for test water and trench dewatering discharge sites from Regional Water Quality Control Board (MPM 20).	No
Reduced water quality from discharge of hydrostatic test water or trench dewatering.	Test hydrostatic test water and trench water before discharge to ensure that levels of contaminants specified in NPDES permits are not exceeded (MPM 20).	No
Potential contamination of surface waters or shallow aquifers from spills or leaks of fuels or lubricants.	Minimize potential for spills to enter waters by following refueling and fuel storage requirements in FERC staff's Procedures; follow SPCC Plan as discussed under groundwater above (MPM 16).	No
Although planned directionally drilling under the 12 crossings of major rivers (table 5.3.3.2-1) will minimize effects on water quality, aquatic life, and adjacent riparian areas, geotechnical testing has not yet been completed, and directional drilling can fail for reasons other than soils.	If directional drilling proves infeasible, develop site-specific open-cut crossing plans for review and approval before construction (ARM 19).	No
Projected-related interruption of or damage to an irrigation system.	Coordinate any water shutoffs with affected parties; compensate for any damages; upon completion of open-cut crossings, compact bottom and banks to restore to preconstruction conditions (MPM 25).	No
Collapse or failure of levees.	Repair any levee damaged by pipeline construction activities; where pipeline would be in a levee, locate trench as near center of levee as possible; employ design and construction measures appropriate to soil stability and water level including sloping the sides of the trench, providing support shoring, and using sheet pilings (MPM 26).	No
Impaired water quality in Contra Loma and Mallard Reservoirs from receipt of sediment-laden runoff during construction.	Follow FERC staff's Erosion Control, Revegetation, and Maintenance Plan (appendix A) and Storm Water Pollution Prevention Plan as discussed above (MPM 20).	No
VEGETATION		
Short- or long-term alteration and loss of vegetative cover from clearing and grading of right-of-way.	Implement FERC staff's Erosion Control, Revegetation, and Maintenance Plan (appendix A) and Wetland and Waterbody Construction and Mitigation Procedures (appendix C) (MPM 29). Restore areas disturbed by construction using Project Revegetation Requirements (ARM 24).	No

TABLE ES-2 (cont'd)

Impact	Mitigation Measures a/	Significant After Mitigation?
Long-term loss of mature trees that provide habitat to sensitive species.	Make minor route realignments or narrow the right-of-way to avoid stands of trees in foothill woodlands (MPM 29); submit to the FERC, SLC, and DFG a report citing locations where avoidance of specimen oak trees is not possible with site-specific explanation of removals (ARM 28).	No
Introduction of noxious weeds to previously unaffected areas by construction and maintenance activities.	Identify noxious weeds during preconstruction surveys; follow county recommendations to eradicate and prevent spread of weeds (rinsing of vehicles); conduct postconstruction surveillance of right-of-way to determine efficacy and implement additional measures as necessary (MPM 29).	No
Revegetation failure resulting in long-term loss of habitat and increased dust.	Implement Project Revegetation Requirements (appendix B) including replanting trees and shrubs at locations specified and using seed mixes and rates, seedbed preparation techniques, and planting dates specified (ARM 24); monitor revegetation success for 2 years (3 years in wetlands); implement additional restoration measures such as reseeding if revegetation fails (MPM 14).	No
In Mojave Desert, long-term loss of Mojave desert scrub communities that provide habitat for desert tortoise.	Minimize blading; segregate and properly restore topsoil and seed banks; imprint to assist seedling establishment; salvage and replant species such as Joshua trees, yuccas; and cactus; provide compensation funds or acreage for habitat loss (MPM 31). Avoid Joshua trees taller than 8 feet; replace salvaged plants immediately (ARM 25).	No
Long-term loss of riparian woodlands and chenopod scrub communities that provide habitat for sensitive species.	Make minor route realignments to avoid riparian foothill woodlands and trees larger than 12 inches dbh; directionally drill major stream crossings; limit maintained right-of-way width in wooded areas to 10 feet; provide compensation funds or acreage where riparian habitat supporting sensitive species cannot be avoided (MPM 34). Consult with SLC and DFG regarding compensation for loss of riparian woodlands (ARM 26).	No
Alteration of wetland hydrology or water quality by changing surface or subsurface drainage patterns or by penetrating hydric soils.	Obtain and comply with Section 404 permits to ensure that discharge of dredged and filled materials is minimized and that all practical construction alternatives have been identified and used to reduce impact on wetlands (MPM 30); implement FERC staff's Procedures (appendix C) when crossing riparian freshwater marshes even if they do not meet Federal jurisdictional wetlands criteria (ARM 23).	No
Permanent impact from disturbance to vernal pools due to their sensitivity and limited success of historic restoration efforts.	Realign proposed route or avoid vernal pools by narrowing construction right-of-way; use salvaged and stockpiled seedbank for subsequent replacement instead of seeding within 50 feet of vernal pool habitat; use FERC staff's Procedures (appendix C) where vernal pools are affected; provide compensation acreage for habitat loss (ARM 27). Use horizontal boring or directional drilling methods where crossing of vernal pools cannot be avoided; file site-specific vernal pool restoration plans (ARM 27).	No
Short-term loss of vegetation in alkali lowlands.	Use FERC staff's Procedures (appendix C) when crossing alkali lowlands (ARM 23).	No

TABLE ES-2 (cont'd)

Impact	Mitigation Measures a/	Significant After Mitigation?
WILDLIFE AND AQUATIC RESOURCES		
Temporary and permanent alteration of wildlife species habitat; disturbance, displacement, and mortality of individuals.	Implement mitigation described under Vegetation above.	No
Adverse effects on birds from maintenance of vegetation in permanent right-of-way.	Conduct vegetation maintenance activities no more than once every 3 years and only after August 1 where right-of-way is used for breeding; design and construct project-related powerlines to protect birds (MPM 37).	No
Effects on feeding and breeding of fish from increased sedimentation and turbidity.	Implement FERC staff's Plan and Procedures (appendices A and C) (MPM 14, 20).	No
In wooded riparian areas, long-term loss of habitat from maintaining a 10-foot-wide right-of-way.	Consult with SLC and DFG to determine need for compensation for permanent loss depending on density and quality of each riparian area affected (ARM 26).	No
Disturbance of ongoing revegetation and restoration along west side of Coyote Creek riparian corridor, MP 30 to MP 32.5 on Palo Alto Segment, a primary stopover for migratory waterfowl that contains salt marsh harvest mouse restoration pond.	Narrow the right-of-way to stay within levee area along west side of riparian corridor; coordinate with City of San Jose and Santa Clara Valley Water District during construction within corridor (ARM 29).	No
For sensitive species, same general impact as for Vegetation and Wildlife and Aquatic Resources listed above.	Same general mitigation described for Vegetation and Wildlife and Aquatic Resources above.	No
Displacement or loss of individuals due to intraspecific competition in habitat lost during construction.	Perform preconstruction surveys to identify occupied habitat; make minor realignments to avoid habitat; conduct worker education program (MPM 39).	No
Permanent habitat loss within permanently maintained right-of-way, at new compressor stations, and outside previously disturbed right-of-way in Mojave Desert.	Inspect blasting zones; remove individuals of sensitive animal species; check active burrow entrances after blasting and release any trapped animals; report accidental deaths or injuries; restore right-of-way and monitor revegetation success; compensate for permanent loss of habitat with funds or acreage based on species and acreage affected; consult with FWS as required by Section 7 of Federal Endangered Species Act (MPM 39); consult with DFG as required by California Endangered Species Act (ARM 40).	No
Depending on species, short- and long-term impact that could include construction-induced reproductive failure or mortality or temporary or permanent loss of habitat as summarized in table 5.6.3-1.	Implement mitigation measures listed in table 5.6.3-1 including: preconstruction surveys; avoidance of dens, nests, burrows, and other breeding areas; revegetation/reclamation of disturbed areas; hand excavation/removal of individuals before blasting or other construction scheduling to avoid affecting breeding, migration, or other sensitive activities; replacement of individual plants (ARMs 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40).	No
In the Coast Ranges-San Francisco Bay Area, long-term loss of foothill woodland communities where mature trees cannot be avoided by minor pipeline realignments.	Where oak trees larger than 6 inches dbh are removed, replace with container plants at 10:1 ratio or with acorns at 30:1 ratio (MPM 36).	No

TABLE ES-2 (cont'd)

Impact	Mitigation Measures a/	Significant After Mitigation?
LAND USE		
Temporary clearing of 5,437 or 5,692 acres of land with 628 or 632 acres of permanent right-of-way.	Return land cleared by construction to previous use as approved by landowner (MPM 68).	No
Short- and long-term agricultural impact including loss of standing crops, orchard trees, and vineyards.	Determine compensation to landowners during easement negotiations (MPM 68).	No
Temporary localized noise, dust, and traffic, particularly at residences within 50 feet of right-of-way.	Reduce work space and size of crews and equipment; limit construction to daylight hours; minimize length of time trench is open; use specialized construction techniques such as sewerline/stovepipe or drag-section construction (MPM 66); prohibit removal of mature trees or specialized landscaping unless necessary for safety; fence edge of construction work area; either maintain at least 25 feet between residences and construction or file site-specific plan for approval by FERC and SLC identifying construction techniques and timing (ARM 41).	No
Alteration of residential landscaping.	Restore all lawns and landscaping (MPM 66); restore lawns and landscaping immediately after backfilling where construction is within 50 feet of residence (ARM 41).	No
In commercial/industrial areas, disruption of pedestrian or vehicular traffic, inconvenience, and potential loss of revenues.	Provide steel grate planks across trench or right-of-way; time construction to avoid peak business periods (MPM 67).	No
Potential land use concerns (see table 5.7.1.3-1) including conflicts with existing or proposed development, transportation improvement projects, or land use plans:		
Conflict with commercial development at beginning of Fremont Segment.	Install block valve in a vault within the street (MPM 73).	No
Interference with transportation improvement projects underway at Fremont Blvd/I-880 interchange (MP 3.1) and Auto Mall Parkway/I-880 interchange (MP 5.5) on Fremont Segment; significant disruption of traffic flow due to major in-street construction on Auto Mall Parkway (MP 4.6 to MP 7.2.)	Coordinate construction with Cal Trans and City of Fremont to minimize conflicts and maintain traffic flow; implement night construction hours if adverse effects on traffic cannot otherwise be avoided (MPM 74).	No
Bank instability adjacent to pond used for groundwater recharge facility.	Consult with Alameda County Water District and move pipeline to south side of railroad if necessary (MPM 76).	No
Limited construction work space or maintenance access due to planned rail line from MP 41 to MP 42 on Palo Alto Segment.	Complete detailed engineering in consultation with Santa Clara County Transportation Agency and City of Mountain View to avoid adverse impact and conflicts with planned Tasman Light Rail Line (MPM 79).	No
On Oakland Segment, traffic disruption and other effects of construction that could coincide with widening of Dublin Blvd. scheduled for 1995 (MP 9.8 to MP 11.8).	Coordinate engineering and construction schedule with Dublin Public Works Department (MPM 78).	No

TABLE ES-2 (cont'd)

Impact	Mitigation Measures a/	Significant After Mitigation?
Construction schedule conflicts with grade separation projects in Redwood City, San Carlos, and Belmont along Hunters Point Segment (MP 4.9 to MP 9.8).	Coordinate construction with affected jurisdictions to avoid or minimize interference with ongoing and planned projects (MPM 79).	No
Loss of structural integrity of the railroad embankment currently being constructed to elevate the railroad tracks.	Develop route variations if needed to avoid areas of proposed construction and utility space constraints (MPM 79).	No
TRANSPORTATION		
Increased vehicular traffic; disruption of traffic flow at open-cut crossings of county and local roads.	Complete open-cut crossings in 1 day; control or detour traffic in a safe manner; keep roads open and passable or construct suitable bypass to keep traffic flowing (MPM 70).	No
Traffic flow disruption and delays due to in-street construction.	Use traffic management techniques described in section 4.7.2 to maintain safety and reduce delays (MPM 71).	No
RECREATION		
Temporary increased noise and dust, visual intrusion, and inconvenience or restrictions on activities of recreationists in public parks and other designated recreation areas due to construction equipment.	Realign proposed route to avoid sensitive recreation areas such as trails if possible; maintain hiker access on trails if public safety can be maintained or provide detours if allowed by management agency during construction; water dirt and gravel roads to reduce dust caused by construction equipment; restore trails and other recreational facilities crossed and revegetate disturbed soils so recreational use can resume (MPM 72).	No
Increased hazards to public safety from construction close to intensively used reservoir at Contra Loma Regional Park on North Mainline (MP 269.8 to MP 270.8/MP 278.6 to MP 279.5).	Install temporary safety fencing and warning signs between trench and nearby highly used areas (ARM 42).	No
Disruption of Stanford University Stadium traffic along El Camino Real and a campus road (MP 47.2 on Palo Alto Segment); significant traffic congestion and delays on local streets including access road to Candlestick Point State Recreation Area and U.S. Highway 101 if construction coincides with scheduled sports events at Candlestick Park.	Use temporary traffic controls to minimize traffic-related impact during in-street construction (MPM 71); Work closely with Stanford University and Candlestick Park to minimize conflicts with scheduled events (ARM 43).	No
Effects on areas protected by California Desert Protection Act.	Pending further clarification of boundaries, no direct impact is expected.	No
VISUAL RESOURCES		
Long-term visual impact from clearing right-of-way at wooded stream crossings or if soil stabilization and revegetation on steep slopes are unsuccessful.	Restore and revegetate right-of-way as described under Soils and Vegetation above.	No
Long-term contrasts between aboveground facilities and surrounding natural environment.	Curve the boundaries of cleared right-of-way to eliminate straight-line views and blend with natural topography and vegetation; leave foliage adjacent to pipeline and compressor and meter station sites undisturbed for maximum screening; paint aboveground facilities uniform, noncontrasting color (MPM 82).	No
Long-term visual impact from loss of established landscaping such as mature trees, especially on tree-lined streets.	Restore lawns and residential landscaping (MPM 68).	No

TABLE ES-2 (cont'd)

Impact	Mitigation Measures a/	Significant After Mitigation?
SOCIOECONOMICS		
No significant impact because of distribution of construction and permanent work forces and widespread availability of housing and services in project area.	Not applicable.	No
CULTURAL RESOURCES		
Direct effects including damage to or destruction of all or part of an historic property, information loss, and alteration of characteristics that make property significant; indirect effects are isolation from historic setting or diminution of integrity of setting e.g., vandalism of site; pipeline-related soil erosion; impact on human remains, cultural items, and other cultural resources discovered during construction; 5 sites appear to be listed on National Register of Historic Properties, 7 sites are recommended as eligible, 77 have been evaluated as not eligible, and remainder are unevaluated but currently under review by FERC, SLC, BLM, and SHPO.	Defer construction until final cultural resources inventory report is prepared and submitted to FERC, SLC, BLM, and State Historic Preservation Office along with any testing and evaluation reports, any necessary treatment plans, and comments on all cultural resource reports; implement recommended treatment for sites listed in table 5.9.3-1 (ARM 47).	No
AIR QUALITY AND NOISE		
Temporary construction impact including construction equipment engine emissions and fugitive dust emissions from soil disturbing activities; air quality impact predicted to exceed local air pollution control or management districts' significant unavoidable impact thresholds for emissions from construction-related equipment and activities during the construction period as follows: Mojave Desert District - CO, NO_x, and PM10; San Joaquin Valley District - CO, VOC, NO_x, and PM10; Sacramento District - PM10; and Bay Area District - VOC, NO_x, and PM10.	Require ride-sharing during pipeline (4 workers per vehicle) and compressor station (2 workers per vehicle) construction; implement dust control plan; control fugitive dust from the right-of-way by limiting the disturbed area, reducing speeds, and watering roads as needed; use matting as required during blasting; cover trucks transporting soils; remove spilled soil from paved roads; maintain and tune internal combustion engines according to manufacturer's specifications; implement additional measures to control fugitive dust and reduce other emissions if required by local districts (MPM 85).	Yes
Long-term reductions in air quality from compressor station emissions during operation.	Obtain permits; use Best Available Control Technology; purchase offsets for Amboy and Famoso; use electric-motor-driven compressors at Daggett and Lindsay (MPM 86).	No
Increased noise during construction of pipeline and compressor stations.	Use proper operating techniques; construct during daytime; use equipment with manufacturer-installed noise abatement equipment (MPM 87).	No
During operation, predicted noise from Lindsay Compressor Station may exceed Ldn of 55dB(A) at nearby noise sensitive areas.	Conduct noise survey after putting station into full operation and file survey report with FERC and SLC; if noise limit is exceeded, install additional noise controls to meet limit within 1 year, then confirm compliance with noise limit by filing second noise survey with FERC and SLC (ARM 44).	No

TABLE ES-2 (cont'd)

Impact	Mitigation Measures a/	Significant After Mitigation?
RELIABILITY AND SAFETY		
Small increase in risk from pipeline-related accidents.	Meet DOT Minimum Federal Safety Standards to adequately protect public from natural gas facility failures; meet Federal and state requirements for fire prevention, evacuation, and hazards communication; continue conducting pipeline damage control program including corrosion control and leak surveys; mark locations of underground facilities; participate in One-Call program; install automatic shutoff devices at block valves in heavily populated areas; radiographically inspect 100% of welds; use automated inspection devices for internal system inspections; meet with local emergency service agencies annually (MPM 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99).	No
Health effects from airborne contaminated soil.	Follow General Contingency Plan (MPM 100). Treat potentially contaminated soil as contaminated until tested; consult with agencies to identify locations requiring further investigation and/or mitigation (ARMs 45, 46).	No

TABLE OF CONTENTS
Mojave Northward Expansion Project
Draft Environmental Impact Report/Environmental Impact Statement

VOLUME I

Section			Page
EXECUTIVE SUMMARY			ES-1
	Introduction		ES-1
	Proposed Action		ES-1
	Alternatives		ES-3
	Public Scoping and Areas of Concern		ES-4
	Major Impact Conclusions		ES-5
	Environmental Staff Conclusions		ES-10
TABLE OF CONTENTS			i
LIST OF FIGURES			vi
LIST OF TABLES			viii
ACRONYMS AND ABBREVIATIONS			xii
1.	INTRODUCTION		1-1
	1.1	PURPOSE OF AND NEED FOR THE PROPOSED PROJECT	1-1
	1.2	FERC AND SLC CERTIFICATION PROCESSES	1-4
	1.3	COMPLIANCE WITH NEPA, CEQA, AND OTHER LAWS	1-6
	1.4	PERMIT REQUIREMENTS	1-8
	1.5	SCOPE OF THE EIR/EIS	1-8
		1.5.1 Summary of Scoping	1-8
		1.5.2 Issues Addressed in the EIR/EIS	1-9
		1.5.3 Organization of the EIR/EIS	1-11
2.	DESCRIPTION OF THE PROPOSED PROJECT		2-1
	2.1	DESCRIPTION OF EXISTING OPERATIONS	2-1
	2.2	DESCRIPTION OF THE PROPOSED FACILITIES	2-1
		2.2.1 Core Project	2-6
		2.2.2 Modifications to Serve Alternative Customer Group 1	2-6
		2.2.3 Modifications to Serve Alternative Customer Group 2	2-11
		2.2.4 Nonjurisdictional Facilities	2-11
	2.3	LAND REQUIREMENTS	2-12
		2.3.1 Pipeline Rights-of-Way and Additional Construction Work Areas	2-12
		2.3.2 Aboveground Facilities	2-15
	2.4	CONSTRUCTION PROCEDURES	2-15
		2.4.1 General Pipeline Construction Procedures	2-15
		2.4.2 Construction Procedures for Road, Rail, Waterbody, and Wetland Crossings	2-19
		2.4.3 Construction in Residential Areas	2-22
		2.4.4 Compressor and Meter Station Construction Procedures	2-22
		2.4.5 Mainline Valve Construction Procedures	2-23

TABLE OF CONTENTS (cont'd)

Section Page

2.4.6 Access Roads 2-23
2.5 OPERATION AND MAINTENANCE 2-23
2.6 SAFETY CONTROLS 2-25
2.7 CONSTRUCTION SCHEDULE 2-25
2.8 PROPOSED MITIGATION 2-25
2.9 FUTURE PLANS AND ABANDONMENT 2-26

3. MOJAVE PIPELINE EXPANSION ALTERNATIVES 3-1
3.1 NO ACTION OR POSTPONED ACTION 3-1
3.2 SYSTEM ALTERNATIVES 3-5
3.3 MAJOR ALTERNATIVE ROUTES 3-6
3.3.1 Mojave Desert 3-6
3.3.2 Central Valley 3-6
3.3.3 Coast Ranges - San Francisco Bay Area 3-9
3.4 MINOR ROUTE VARIATIONS 3-20

4. AFFECTED ENVIRONMENT 4-1
4.1 GEOLOGY 4-1
4.1.1 Physiography and Geologic Setting 4-1
4.1.2 Geologic Hazards 4-2
4.1.3 Mineral Resources 4-5
4.1.4 Paleontologic Resources 4-5
4.2 SOILS 4-17
4.2.1 General Soil Conditions 4-17
4.2.2 Soil Groups 4-17
4.2.3 Soils at Proposed Compressor Stations 4-20
4.3 WATER RESOURCES 4-32
4.3.1 Groundwater 4-32
4.3.2 Surface Water 4-38
4.4 VEGETATION 4-52
4.4.1 Mojave Desert 4-55
4.4.2 Central Valley 4-56
4.4.3 Coast Ranges - San Francisco Bay Area 4-58
4.5 WILDLIFE AND AQUATIC RESOURCES 4-66
4.5.1 Mojave Desert 4-66
4.5.2 Central Valley 4-67
4.5.3 Coast Ranges - San Francisco Bay Area 4-69
4.6 SPECIAL STATUS SPECIES 4-75
4.6.1 Mojave Desert 4-75
4.6.2 Central Valley 4-76
4.6.3 Coast Ranges - San Francisco Bay Area 4-80

TABLE OF CONTENTS (cont'd)

Section Page

4.7 LAND USE, TRANSPORTATION, RECREATION, AND VISUAL RESOURCES 4-97
4.7.1 Land Use 4-97
4.7.2 Transportation 4-103
4.7.3 Recreation and Public Interest Areas 4-103
4.7.4 Visual Resources 4-108
4.8 SOCIOECONOMICS 4-121
4.9 CULTURAL RESOURCES 4-125
4.9.1 Background 4-125
4.9.2 Inventory Results 4-128
4.10 AIR QUALITY AND NOISE 4-134
4.10.1 Air Quality 4-134
4.10.2 Noise 4-139

5. ENVIRONMENTAL CONSEQUENCES 5-1
5.1 GEOLOGY 5-1
5.1.1 Criteria for Evaluating Impact and Determining Significance 5-1
5.1.2 General Impact and Mitigation 5-2
5.1.3 Site-Specific Impact and Mitigation 5-7
5.1.4 Impact on Paleontologic Resources 5-9
5.2 SOILS 5-14
5.2.1 Criteria for Evaluating Impact and Determining Significance 5-14
5.2.2 General Impact and Mitigation 5-14
5.2.3 Site-Specific Impact and Mitigation 5-16
5.2.4 Impact and Mitigation of Aboveground Facilities 5-18
5.3 WATER RESOURCES 5-19
5.3.1 Criteria for Evaluating Impact and Determining Significance 5-19
5.3.2 Groundwater 5-19
5.3.3 Surface Water 5-22
5.4 VEGETATION 5-30
5.4.1 Criteria for Evaluating Impact and Determining Significance 5-30
5.4.2 General Impact and Mitigation 5-30
5.4.3 Site-Specific Impact and Mitigation 5-33
5.5 WILDLIFE AND AQUATIC RESOURCES 5-45
5.5.1 Criteria for Evaluating Impact and Determining Significance 5-45
5.5.2 General Impact and Mitigation 5-45
5.5.3 Site-Specific Impact and Mitigation 5-46
5.6 SPECIAL STATUS SPECIES 5-51
5.6.1 Criteria for Evaluating Impact and Determining Significance 5-51
5.6.2 General Impact and Mitigation 5-51
5.6.3 Site-Specific Impact and Mitigation 5-54

TABLE OF CONTENTS (cont'd)

Section Page

5.7 LAND USE, TRANSPORTATION, RECREATION, AND VISUAL RESOURCES 5-86
5.7.1 Land Use 5-86
5.7.2 Transportation 5-99
5.7.3 Recreation and Public Interest Areas 5-100
5.7.4 Visual Resources 5-105
5.8 SOCIOECONOMICS 5-110
5.8.1 Criteria for Evaluating Impact and Determining Significance 5-110
5.8.2 General Impact and Mitigation 5-110
5.8.3 Site-Specific Impact and Mitigation 5-113
5.9 CULTURAL RESOURCES 5-114
5.9.1 Criteria for Evaluating Impact and Determining Significance 5-114
5.9.2 General Impact and Mitigation 5-114
5.9.3 Site-Specific Impact and Mitigation 5-115
5.10 AIR QUALITY AND NOISE 5-119
5.10.1 Air Quality 5-119
5.10.2 Noise 5-129
5.11 RELIABILITY AND SAFETY 5-134
5.11.1 Safety Standards 5-134
5.11.2 Pipeline Incident Rates 5-135
5.11.3 Pipeline Safety Features 5-139
5.11.4 Contaminated Soil and Groundwater 5-142
5.12 CUMULATIVE IMPACT 5-145
5.13 GROWTH-INDUCING IMPACT OF THE PROPOSED ACTION 5-149

6. COMPARISON OF THE ALTERNATIVES TO THE PROPOSED PROJECT 6-1
6.1 TRACY TO ANTIOCH SOUTHERN PACIFIC RAILROAD NORTHWARD ALTERNATIVE ROUTE 6-1
6.2 SAN JOAQUIN VALLEY PIPELINE NORTHWARD ALTERNATIVE ROUTE 6-3
6.3 INTERSTATE 680 CORRIDOR SOUTHWARD ALTERNATIVE ROUTE 6-3

7. CONCLUSIONS AND RECOMMENDATIONS 7-1
7.1 ALTERNATIVES 7-1
7.1.1 No-Action and System Alternatives 7-1
7.1.2 Preferred Route Alternative 7-2
7.2 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USE OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY 7-2
7.3 SIGNIFICANT UNAVOIDABLE IMPACT 7-2

TABLE OF CONTENTS (cont'd)

Section | Page

7.4 SIGNIFICANT IRREVERSIBLE ENVIRONMENTAL CHANGES THAT WOULD BE INVOLVED IN THE PROPOSED PROJECT SHOULD IT BE IMPLEMENTED 7-3
7.5 RECOMMENDED MITIGATION MEASURES 7-3
  7.5.1 Conditions Imposed by the FERC and SLC 7-3
  7.5.2 Mitigation Measures Proposed by Mojave 7-14

APPENDIX A: FERC STAFF'S EROSION CONTROL, REVEGETATION, AND MAINTENANCE PLAN

APPENDIX B: PROJECT REVEGETATION REQUIREMENTS

APPENDIX C: FERC STAFF'S WETLAND AND WATERBODY CONSTRUCTION AND MITIGATION PROCEDURES

APPENDIX D: COMPENSATION CALCULATIONS AND BIOLOGICAL RESOURCE PROTOCOLS

APPENDIX E: REFERENCES AND CONTACTS

APPENDIX F: LIST OF PREPARERS

APPENDIX G: EIR/EIS DISTRIBUTION LIST

APPENDIX H: SUBJECT INDEX

VOLUME II: MAPS

LIST OF FIGURES

Figure	Title	Page
ES-1	Overview of Proposed Routes to Serve Various Customer Groups	ES-2
1.1-1	Overview of Proposed Route and Alternative Routes to Serve Alternative Customer Groups	1-2
2.2-1	Overview of Proposed Routes to Serve Various Customer Groups	2-2
2.2-2	Typical Project Facilities	2-3
2.2-3	Typical Compressor Station Site Plan (Daggett)	2-4
2.2-4	Typical Meter Station Site Plan	2-5
2.3.1-1	Pipeline Location Along Southern Pacific Railroad Right-of-Way	2-13
2.3.1-2	Cross Sections of Typical Construction Rights-of-Way on Even and Sloping Terrain	2-14
2.4.1-1	Typical Pipeline Construction Spread	2-17
2.4.2-1	Cross Sections of Typical Road Crossings	2-20
2.4.2-2	Plan and Profile of Typical Major Stream or River Crossing	2-21
3.0-1	Project Design Alternatives	3-2
3.3.2-1	Overview of Central Valley Routes Evaluated	3-8
3.3.3-1	San Francisco Bay Area Alternative Routes	3-11
3.4-1	Livermore/Railroad and South Livermore/Aqueduct Route Variations	3-23
3.4-2	Tri-Valley/Greenville Road Route Variation	3-24
3.4-3	Northeast Pleasanton Route Variation	3-26
3.4-4	Pleasanton/Ridge Route Variation	3-27
3.4-5	San Carlos/Railroad Route Variation	3-28
3.4-6	Fremont/Auto Mall Parkway Route Variation	3-30
3.4-7	Fremont/Southside Railroad Route Variation	3-31
3.4-8	Santa Clara/Railroad Route Variation	3-32

LIST OF FIGURES (cont'd)

Figure	Title	Page
3.4-9	Antioch/Railroad and Antioch/Wilbur Avenue Route Variations	3-33
4.10.1.1-1	Ozone Nonattainment Areas	4-136
4.10.1.1-2	PM10 Nonattainment Areas	4-137

LIST OF TABLES

Table	Title	Page
ES-1	Summary of Potentially Significant Impact of the Mojave Northward Expansion Project	ES-6
ES-2	Summary of Impact and Mitigation Measures	ES-12
1.4-1	Permitting Requirements for the Mojave Northward Expansion Project	1-13
1.5.1-1	Summary of Comments on the Mojave Northward Expansion Project Received at the Public Scoping Meetings or By Letter	1-10
2.2.1-1	Proposed Pipeline Segments for Core and Additional Customer Groups	2-7
2.2.1-2	Proposed Compressor Stations	2-8
2.2.1-3	Proposed Meter Stations	2-9
2.3.1-1	Proposed Stockpile Areas	2-16
3.0-1	Alternative Route Suggestions Received During Public Scoping	3-3
3.3.2-1	Central Valley Alternative Routes Considered But Eliminated	3-7
3.3.3.1-1	San Francisco Bay Area Northward Alternative Routes	3-13
3.3.3.1-2	Comparison of San Francisco Bay Area Northward Alternative Routes with Mojave's Proposed North Mainline	3-16
3.3.3.2-1	San Francisco Bay Area Southward and Westward Alternative Routes	3-18
3.3.3.2-2	Comparison of San Francisco Bay Area Southward and Westward Alternative Routes with Mojave's Proposed Oakland and Palo Alto Segments	3-19
3.4-1	Route Variations	3-21
4.1.1.1-1	Geologic Hazards and Geologic Areas with Potential Significant Impact Along the Proposed Route	4-6
4.1.4-1	Paleontologic Resources In or Near the Proposed Construction Right-of-Way	4-14
4.2.2-1	Soils With Potential for Significant Impact Along the Proposed Route	4-22

LIST OF TABLES (cont'd)

Table	Title	Page
4.2.2-2	Soil Groups Crossed by the Proposed Route	4-18
4.3.1-1	Areas of Shallow Groundwater Along the Proposed Route	4-33
4.3.1-2	Public Supply Wells Within 0.10 Mile of the Proposed Route	4-34
4.3.1-3	Summary of Groundwater Quality Along the Proposed Route by Groundwater Basin	4-35
4.3.2-1	Surface Waters Crossed by the Proposed Route	4-43
4.3.2-2	Summary of Surface Water Quality Problems Along the Proposed Route	4-39
4.4-1	Common and Scientific Names of Plants Potentially Occurring Along the the Proposed Route	4-53
4.4-2	Wetlands Crossed by the Proposed Pipeline Route	4-62
4.4.2.3-1	Vernal Pools and Nonnatural Ponding Areas In or Adjacent to the Proposed Route	4-59
4.5-1	Common and Scientific Names of Animals Potentially Occurring Along the Proposed Route	4-72
4.5.2.2-1	Fish Species in Surface Waters Crossed by the Proposed Route	4-70
4.6-1	Sensitive Plant and Wildlife Species Addressed by Field Surveys	4-85
4.6-2	Sensitive Species and Habitats Identified and Potentially Affected Along the Proposed Route	4-90
4.7.1.1-1	Construction and Operation Areas Required for the Proposed Project	4-98
4.7.1.1-2	Summary of Land Ownership Along the Proposed Route	4-101
4.7.1.1-3	Residences Within 50 Feet of the Construction Right-of-Way	4-112
4.7.1.2-1	Land Uses at the Proposed Meter Station Sites	4-104
4.7.2-1	Major Highways Crossed by the Proposed Route	4-106
4.7.3-1	Recreation and Public Interest Areas Crossed By or Near the Proposed Route	4-117

LIST OF TABLES (cont'd)

Table	Title	Page
4.7.4-1	Sensitive Scenic Resources Along the Proposed Route	4-110
4.8-1	Socioeconomic Data for Counties Affected by the Project	4-122
4.8-2	Housing Information for Selected Communities Along the Proposed Route	4-123
4.9.1.2-1	Areas Along Proposed Route Previously Inventoried for Cultural Resources	4-127
4.9.2.1-1	Number of Sites Within the Survey Corridor	4-129
4.9.2.2-1	Native Americans Contacted	4-131
4.10.1.1-1	Federal and State Ambient Air Quality Standards	4-135
4.10.2-1	Noise-Sensitive Areas Near the Proposed Compressor Stations and Local Noise Standards	4-140
5.1.2-1	Areas of Potential Significant Geologic Impact	5-11
5.3.3.2-1	Major Rivers and Streams Crossed by the Proposed Route Where Directional Drilling is Proposed	5-26
5.4.3-1	Acreages of Vegetation Types Crossed by the Proposed Route	5-42
5.4.3.2-1	Central Valley Wetlands	5-37
5.4.3.3-1	Wetlands in the Coast Ranges-San Francisco Bay Area	5-41
5.6.2-1	Portions of the Proposed Route Requiring Field Surveys for Special Status Species	5-53
5.6.3-1	Impact and Mitigation for Sensitive Species Along the Proposed Route	5-76
5.6.3-2	Summary of Sensitive Species Habitats Potentially Affected Along the Proposed Route	5-83
5.6.3.1-1	Detailed Breakdown of Desert Tortoise Occupied Habitat	5-56
5.7.1.2-1	Right-of-Way Acreages Required by Land Use Type	5-86
5.7.1.2-2	Acreages That Would Be Affected by the Construction and Operation of the Proposed Project	5-88

LIST OF TABLES (cont'd)

Table	Title	Page
5.7.1.3-1	Areas of Potential Land Use Concern Along the Proposed Route	5-93
5.8.2.1-1	Population Increases and Housing Availability in Selected Communities Along the Proposed Route	5-112
5.9.2-1	NRHP Status of Sites Identified for the Mojave Northward Expansion Project	5-116
5.9.3-1	Sites Listed on the NRHP or Recommended as Eligible for Listing on the NRHP and That Could Be Affected by the Proposed Project	5-117
5.10.1.3-1	Construction Emissions Summary	5-121
5.10.1.5-1	Estimated Compressor Station Emissions	5-126
5.10.2.3-1	Impact of Proposed Compressor Stations on Nearest Noise-Sensitive Areas (NSAs)	5-131
5.11.2-1	Historical Incident, Injury, and Fatality Rates for Natural Gas Pipelines	5-137
5.11.2-2	Nationwide Accidental Deaths	5-137
5.11.3-1	Comparison of Factors in Historic Pipeline Incidents with Mojave Northward Expansion Safety Features	5-140
6.0-1	Comparison of San Francisco Bay Area Alternative Routes With Mojave's Proposed North Mainline and Palo Alto Segment	6-2

ACRONYMS AND ABBREVIATIONS

AAQS	Ambient Air Quality Standards
ACHP	Advisory Council on Historic Preservation
ACWSD	Alameda County Water Supply District
ADEQ	Arizona Department of Environmental Quality
Alt.	Alternative route
ANSI	American National Standards Institute
APE	area of potential effect
API	American Petroleum Institute
APSS	Alquist-Priolo Special Studies
ARM	agency-recommended measure
ASTM	American Society for Testing and Materials
AT&SF	Atchison, Topeka and Santa Fe
BA	Biological Assessment
BACT	best available control technology
BART	Bay Area Rapid Transit
Bay Area District	Bay Area Air Quality Management District
BCDC	Bay Conservation and Development Commission
bgs	below ground surface
BLM	U.S. Bureau of Land Management
BO	Biological Opinion
BOR	U.S. Bureau of Reclamation
CalTrans	California Department of Transportation
CCWD	Contra Costa Water District
CDCA	California Desert Conservation Area
CEC	California Energy Commission
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
Certificate	Certificate of Public Convenience and Necessity (FERC)
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CNWS	Concord Naval Weapons Station
CO	carbon monoxide
CPUC	California Public Utilities Commission
CRB	California Reclamation Board
CSFM	California State Fire Marshall
CSWRCB	California State Water Resources Control Board
DBCP	dibromochloropropane
dB(A)	A-weighted decibels
dbh	diameter at breast height
DFG	California Department of Fish and Game
DOI	U.S. Department of the Interior
DMG	California Division of Mines and Geology
DOT	U.S. Department of Transportation

ACRONYMS AND ABBREVIATIONS (cont'd)

DTSC	Department of Toxic Substances Control (California Environmental Protection Agency)
EBRPD	East Bay Regional Park District
EDD	California Employment Development Division
EIR	environmental impact report
EIR/EIS	environmental impact report/environmental impact statement
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act of 1973
F-Factor	EPA Fuel-Factor
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FLMA	Federal Land Management Agency
FWCA	Fish and Wildlife Coordination Act
FWS	U.S. Fish and Wildlife Service
g	force exerted by gravity on a resting body
gr S/100dSCF	grains of sulfur per 100 dry standard cubic feet of natural gas
hp	horsepower
I-5	Interstate Highway 5
Kern River	Kern River Gas Transmission Company
KJ/W-hr	kilojoules per watt-hour
LARPD	Livermore Area Recreation and Park District
LDC	local distribution company
Ldn	day-night sound level
Leq (24)	24-hour equivalent sound level
MEDP	Monitoring and Emergency Discovery Plan (Cultural Resources)
mi-yr	mile-years, i.e., miles of pipeline in service per year
MMBtu	million British thermal units
MMcf	million cubic feet
MMcfd	million cubic feet per day
Mojave	Mojave Pipeline Company
Mojave Desert District	Mojave Desert Air Quality Management District
MP	milepost
MPM	Mojave-proposed measure
MSL	above mean sea level
MTB	U.S. Materials Transportation Bureau
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NGA	Natural Gas Act
NHPA	National Historic Preservation Act
NOP/I	Notice of Preparation/Intent to Prepare EIR/EIS
NO_x	nitrogen oxides
NO_2	nitrogen dioxide
NPDES	National Pollutant Discharge Elimination System

ACRONYMS AND ABBREVIATIONS (cont'd)

NPS	nonpoint source
NRHP	National Register of Historic Places
NSA	noise-sensitive area
NSPS	new source performance standards
NSR	new source review
NWI	National Wetland Inventory
OEC	Optional Expedited Certificate (FERC)
OPR	Office of Pipeline Regulation (FERC)
OSHA	U.S. Occupational Safety and Health Administration
Overview	Cultural Resources Overview
O&M	operation and maintenance
PA	Programmatic Agreement
PG&E	Pacific Gas and Electric Company
PL	pipeline
Plan	Erosion Control, Revegetation, and Maintenance Plan (FERC)
PM10	respirable particulate matter
ppm	parts per million
ppmv	parts per million by volume
PRMP	Paleontologic Resource Management Plan
Procedures	Wetland and Waterbody Construction and Mitigation Procedures (FERC)
PSD	prevention of significant deterioration (EPA)
psig	pounds per square inch gauge
Requirements	Project Revegetation Requirements
ROW	right-of-way
RV	recreational vehicle
RWQCB	Regional Water Quality Control Board
Sacramento District	Sacramento Metropolitan Air Quality Management District
San Joaquin District	San Joaquin Valley Unified Air Pollution Control District
SCADA	Supervisory Control and Data Acquisition (Mojave)
SCS	Soil Conservation Service
Secretary	Secretary of the FERC
SEDAB	Southeast Desert Air Basin
SFBAAB	San Francisco Bay Area Air Basin
SHPO	California State Historic Preservation Office
SIP	state implementation plan
SJVAB	San Joaquin Valley Air Basin
SJVP	San Joaquin Valley Pipeline
SLC	California State Lands Commission
SMUD	Sacramento Municipal Utilities District
SoCal Gas	Southern California Gas Company
South Coast District	South Coast Air Quality Management District
SO_x	sulfur oxides
SO_2	sulfur dioxide
SO_4	sulfate
SP	Southern Pacific
SPCC Plan	Spill Prevention, Containment, and Control Plan

ACRONYMS AND ABBREVIATIONS (cont'd)

SSA	sole-source aquifer
SVAB	Sacramento Valley Air Basin
SWPP Plan	Storm Water Pollution Prevention Plan
TCE	trichloroethylene
TDS	total dissolved solids
USACE	U.S. Army Corps of Engineers
USC	United States Code
USGS	U.S. Geological Survey
VOC	volatile organic compound
VQO	visual quality objective
VRM	visual resource management (BLM)
WCC	Woodward-Clyde Consultants
$\mu g/m^3$	micrograms per cubic meter

1.0 INTRODUCTION

1.1 PURPOSE OF AND NEED FOR THE PROPOSED PROJECT

The Federal Energy Regulatory Commission (FERC) and the California State Lands Commission (SLC) have prepared this draft environmental impact report/environmental impact statement (EIR/EIS) to assess the environmental effects of a proposal by the Mojave Pipeline Company (Mojave) to expand its existing natural gas facilities into Central and Northern California. The proposed expansion, referred to as the Mojave Northward Expansion Project, would deliver 475 million cubic feet (MMcf) of natural gas per day to customers in parts of the San Joaquin Valley, the San Francisco Bay Area, and Sacramento. The existing Mojave pipeline system, completed in 1992, provides interstate natural gas transportation service from Topock, Arizona, to its terminus near Bakersfield, California.

On March 17, 1993, pursuant to Section 7(c) of the Natural Gas Act (NGA), as amended, Mojave filed an application with the FERC in Docket No. CP93-258-000 for an Optional Certificate of Public Convenience and Necessity (Certificate) to construct and operate the proposed expansion. On November 3, 1993, and April 18, 1994, in Docket Nos. CP93-258-001 and CP93-258-003, respectively, Mojave filed amendments proposing various route and facility changes. As detailed in section 2, the proposed expansion will consist of core project facilities to serve a core customer group plus additional facilities to serve one of two additional customer groups. Depending on the final project configuration, the major facilities that Mojave now proposes to construct consist of:

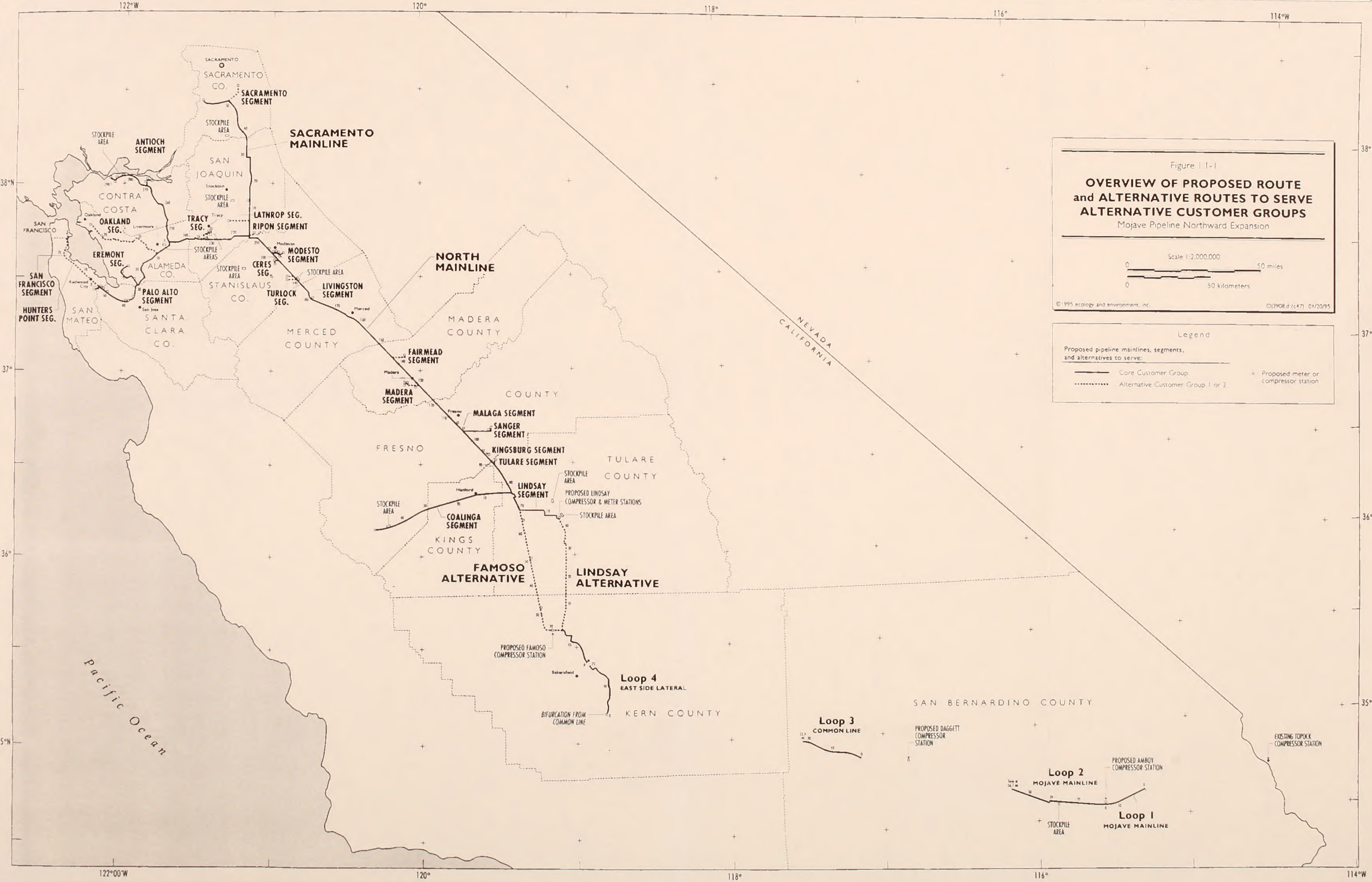
- Between 660 and 681 miles of new pipeline with diameters ranging from 4 to 30 inches. The new pipeline includes (1) a North Mainline about 240 miles long from near Bakersfield northward to Martinez; (2) a Sacramento Mainline about 63 miles long from Ripon to southwest Sacramento; (3) shorter segments that may include pipelines to Lindsay, Famoso, Coalinga, Kingsburg, Sanger, Livingston, Turlock, Ceres, Modesto, Tracy, Oakland, Antioch, Fremont, McFarland, Malaga, Madera, Fairmead, Ripon, Lathrop, Hunters Point, and San Francisco; and (4) a maximum of about 100 miles of 30-inch-diameter pipeline loops on the existing Mojave Mainline, Mojave-Kern River East Side Lateral, and Mojave-Kern River Commonline. (A pipeline loop is a segment of pipeline installed parallel to an existing pipeline and connected to it at both ends in order to increase the volume of gas that can be transported through the pipeline system.)

- Three new compressor stations in California near Amboy, Daggett, and either Famoso or Lindsay providing a total of 62,588 to 78,758 horsepower (hp) of compression plus modifications at Mojave's existing compressor station in Topock, Arizona, to add 24,470 hp of compression.

- Either 55 or 58 new meter stations.

About 80 percent of the total proposed route, shown in figure 1.1-1, is in or directly adjacent to rights-of-way for railroads, surface roads, pipelines, or electric transmission lines. The total estimated cost to construct the proposed Mojave Northward Expansion Project facilities is about $500 million in 1994 dollars. Mojave's anticipated in-service date is early 1996 with construction starting in mid 1995.

THIS PAGE INTENTIONALLY BLANK



122°W
120°
118°
116°
114°W
38°N
37°
36°
35°N
122°00'W
SACRAMENTO
SACRAMENTO CO.
SACRAMENTO SEGMENT
STOCKPILE AREA
SACRAMENTO MAINLINE
STOCKPILE AREA
ANTIOCH SEGMENT
SAN JOAQUIN
Stockton
STOCKPILE AREA
CONTRA COSTA
SAN FRANCISCO
Oakland
OAKLAND SEG.
Livermore
TRACY SEG.
Tracy
LATHROP SEG.
RIPON SEGMENT
STOCKPILE AREAS
Modesto
MODESTO SEGMENT
EREMONT SEG.
ALAMEDA CO.
STOCKPILE AREA
CERES SEG.
STOCKPILE AREA
NORTH MAINLINE
SAN FRANCISCO SEGMENT
Redwood City
STANISLAUS CO.
TURLOCK SEG.
LIVINGSTON SEGMENT
PALO ALTO SEGMENT
San Jose
Merced
HUNTERS POINT SEG.
SAN MATEO
SANTA CLARA CO.
MERCED COUNTY
MADERA COUNTY
FAIRMEAD SEGMENT
Madera
MADERA SEGMENT
COUNTY
Fresno
MALAGA SEGMENT
SANGER SEGMENT
FRESNO
KINGSBURG SEGMENT
TULARE SEGMENT
TULARE COUNTY
STOCKPILE AREA
LINDSAY SEGMENT
Hanford
PROPOSED LINDSAY COMPRESSOR & METER STATIONS
STOCKPILE AREA
STOCKPILE AREA
COALINGA SEGMENT
KINGS COUNTY
FAMOSO ALTERNATIVE
LINDSAY ALTERNATIVE
NEVADA
CALIFORNIA
PROPOSED FAMOSO COMPRESSOR STATION
Bakersfield
Loop 4
EAST SIDE LATERAL
BIFURCATION FROM COMMON LINE
KERN COUNTY
Pacific Ocean
SAN BERNARDINO COUNTY
Loop 3
COMMON LINE
PROPOSED DAGGETT COMPRESSOR STATION
EXISTING TOPOCK COMPRESSOR STATION
PROPOSED AMBOY COMPRESSOR STATION
Loop 2
MOJAVE MAINLINE
Loop 1
MOJAVE MAINLINE
STOCKPILE AREA
Scale 1:2,000,000
0
50 miles
0
50 kilometers
Legend
Proposed pipeline mainlines, segments, and alternatives to serve:
Core Customer Group
Alternative Customer Group 1 or 2
Proposed meter or compressor station
OJ3908.d (c47) 01/20/95

Figure 1.1-1

OVERVIEW OF PROPOSED ROUTE and ALTERNATIVE ROUTES TO SERVE ALTERNATIVE CUSTOMER GROUPS

Mojave Pipeline Northward Expansion

©1995 ecology and environment, inc.

On November 18, 1994, the FERC issued a Preliminary Determination on Nonenvironmental Issues (Preliminary Determination) finding that Mojave's proposed facilities:

- Are required by the public convenience and necessity under Section 7(c) of the NGA.
- Satisfy the requirements for the issuance of a Certificate under the FERC's Optional Expedited Certificate program with the provision that only one of the alternative customer group facility configurations would ultimately be built.

Mojave has stated that the expansion is necessary for two principal reasons: to provide competition and firm, reliable service, i.e., service not subject to curtailment. According to Mojave, there is a need for pipeline-on-pipeline competition in areas currently and exclusively served by Pacific Gas and Electric Company (PG&E), and there is also a need for more reliable natural gas transportation service into the affected market areas.

The need for natural gas transportation service varies with demand, which in turn varies seasonally and in response to changes in industrial activity and fluctuating fuel prices. In areas served by multiple pipelines, brokers attempt to purchase natural gas that can be transported and delivered to end-users at the lowest cost. In nonregulated or "free" markets, natural gas prices in areas served by multiple pipelines are strongly influenced by competition among suppliers. In such markets, natural gas pipeline companies generally compete and develop pipeline systems that have the flexibility to respond to the demands of a variety of markets in a cost-competitive manner. Increased competition and greater reliance on market mechanisms are, according to the Federal Energy Policy Act of 1992, the preferred means to market and deliver energy in the United States. The California Energy Commission (CEC) also fully supports reliance on competitive market forces to provide customers with the best service and lowest-cost natural gas supplies possible (CEC, 1994).

Increased pipeline capacity in Central and Northern California could improve service reliability for segments of the natural gas market. PG&E is regulated by the California Public Utilities Commission (CPUC), which requires PG&E to give priority to its core customers, i.e., residential and small-business customers. PG&E's noncore customers, the industrial and electric generation customers in Northern California, have consequently experienced periodic curtailments. Curtailments of natural gas service to noncore customers in Northern California occurred during the winters of 1988-1989, 1989-1990, and 1990-1991. Total curtailments including voluntary oil burns at utility electric generation facilities and involuntary curtailments due to supply shortages and capacity constraints were 29,251 MMcf in 1989; 15,679 MMcf in 1990; 3,142 MMcf in 1991; 736 MMcf in 1992; and 9,189 MMcf in 1993. Although no source curtailments are forecast for average-temperature years, system curtailments ranging from 317 to 8,292 MMcf are forecast to occur between 1995 and 2000 assuming the unlikely but possible colder-than-normal weather year planning scenario. In January 1993, for example, service to industrial customers was curtailed because of freeze-offs at the wellhead during a period of cold weather in Canada, which prevented delivery of natural gas to California. There was unused interstate pipeline capacity at the Arizona-California border, and, if there had been additional pipeline capacity within California capable of receiving and transporting these available supplies, the curtailments would have been reduced if not avoided all together. Despite the completion of several interstate pipelines increasing the supply of natural gas to California, the CEC believes that curtailments remain possible because of inadequate pipeline and underground storage facilities (CEC, 1994).

Because of the possibility of curtailments, industrial customers and electric generators must be able to burn fuel oil or other fossil fuels, which require storage and pose the risk of spills. The increased availability of natural gas from the proposed project could accelerate the shift to the exclusive use of natural gas by large industrial facilities. For example, the proposed Sacramento Utilities District Cogeneration Facilities that Mojave proposes to serve will not have facilities to store and burn oil because of the supply reliability offered by two sources of natural gas. Because natural gas combustion would decrease NO_x emissions, there is a potential for a net air quality benefit. Recent amendments to the Clean Air Act have tightened air quality control standards. In an effort to clean up the air, natural gas is being substituted for other fossil fuels to reduce the quantities of air pollutants that lead to the formation of ozone. In California, the impact of burning fuels other than natural gas could be significant. The proposed Mojave Northward Expansion Project could reduce the probability that these more polluting fuels would be used.

Mojave contends that its Northward Expansion Project would provide more reliable service by providing additional capacity to transport natural gas from the Arizona-California border to customers in Central and Northern California. The principal markets targeted by Mojave's proposal are industrial and electrical cogeneration customers who currently receive or would otherwise receive service exclusively from PG&E. Mojave's survey of potential customers, conducted from June 12 through August 31, 1992, demonstrated a market interest for about 1,200 MMcfd of firm service in Central and Northern California.

1.2 FERC AND SLC CERTIFICATION PROCESSES

Among its other responsibilities, the FERC, under Section 7 of the NGA, determines whether natural gas transportation facilities are in the public interest and, if so, grants a Certificate of Public Convenience and Necessity to construct and operate them. The FERC bases its decision on technical competence, financing, rates, market demand, gas supply, existing facilities and service, environmental impact, long-term feasibility, and other issues concerning the proposed project. This environmental impact statement (EIS) was prepared in order to comply with the National Environmental Policy Act (NEPA) and the FERC's implementing regulations under Title 18, Code of Federal Regulations (CFR), Chapter I, Part 380.

Although a market need was described in section 1.1 above, under the FERC's Optional Expedited Certificate (OEC) program, Mojave may apply for a Certificate without proving market need. The OEC program was developed by the FERC in order to meet the following goals:

- To provide the full benefits of competition to consumers by facilitating easier entry and exit from services.
- To ensure the most efficient scale for facilities by removing certification as a barrier to entry.
- To provide incentives for competition where none exists by maximizing the use of alternative market access for producers and consumers.

A pipeline is eligible for an OEC if its proponents agree to provide nondiscriminatory, open access transportation under an Order No. 436 Certificate and if the proposed rates for the service are designed so that no inappropriate costs are borne by the pipeline's customers. The basic premise of the OEC regulations is that a project can be presumed to be in the public convenience and necessity if the applicant has assumed the full risk of the project or successfully negotiated the sharing of that risk. The provisions for an OEC, namely the rate conditions and the filing requirements, are tied to that premise. An OEC applicant is not required to file any market or gas supply data, which are required for traditional Section 7 applications. Mojave's March 17, 1993, application was filed under the OEC program and seeks to amend its existing OEC, which was granted by the FERC in 1989 for the existing Mojave pipeline.

The proposed project is also under the jurisdiction of the SLC. The SLC is required to prepare an environmental impact report (EIR) in order to comply with CEQA. Under the direction of the FERC, the lead agency under NEPA, and the SLC, the lead agency under CEQA, we prepared this joint EIR/EIS to comply with both CEQA and NEPA. 1/ This joint effort eliminates duplication of Federal and state efforts as encouraged by Section 1506.2 of the Council on Environmental Quality (CEQ) regulations implementing NEPA and Section 15220 of the CEQA guidelines. The FERC and the SLC will use this EIR/EIS in their decisions on whether to authorize the proposed project. The U.S. Bureau of Land Management (BLM) is a cooperating agency in the preparation of this EIR/EIS because of the large amount of Federal land that the proposed project will affect. The BLM will need to adopt this EIR/EIS in making its decision on whether to issue a right-of-way grant across Federal lands.

As part of the EIR/EIS process, on April 12, 1994, the FERC and the SLC issued a Notice of Preparation/Intent to Prepare a Joint Draft Environmental Impact Report/Statement for the Proposed Mojave Northward Expansion Project and Request for Comments on Environmental Issues (NOP/I). In preparing the mailing list for the NOP/I, we reviewed the route maps filed by Mojave to identify individuals with a potential interest in the proposed project such as property owners. The mailing list included approximately 1,840 organizations and individuals including property owners along the proposed route, Federal, state, county, and local governments and agencies, elected officials, newspapers, and libraries. The NOP/I requested letters of comment from interested parties and invited them to attend the four public scoping meetings conducted jointly by the FERC and SLC. It also included a form for interested parties to use to request copies of the draft and final EIR/EIS.

This draft EIR/EIS was sent to the parties on the distribution list in appendix J, and a notice will be published in the Federal Register, which will begin a 45-day public comment period. Public hearings will be held, and all comments will be addressed in the final EIR/EIS. Copies of the letters of comment received by the FERC and the SLC during the public review period and the FERC's and the SLC's responses will be included in an appendix to the final EIR/EIS.

Upon completion of the EIR/EIS review process, the FERC will issue a final Order, which will address the environmental impact of the proposed project as well as examining system alternatives and route variations. If the FERC determines that the proposed project continues to be required by the public convenience and necessity, a Certificate will be issued authorizing Mojave to construct and operate the Mojave Northward Expansion Project. Once the SLC certifies that this EIR has been prepared pursuant to CEQA, the SLC will act on Mojave's application for crossing state lands.

1/ The pronoun "we," "us," and "our" refer to the staffs of the FERC's Office of Pipeline Regulation (OPR) and the SLC as well as the staff of the BLM as a cooperating agency.

1.3 COMPLIANCE WITH NEPA, CEQA, AND OTHER LAWS

This EIR/EIS is intended to provide decision-makers and the public with information regarding the environmental effects of the construction, operation, and maintenance of the Mojave Northward Expansion Project. NEPA requires the FERC to consider the environmental impact that could result whenever it considers the issuance of a Certificate. Similarly, CEQA requires the SLC to consider the environmental impact that could result within California. This joint EIR/EIS gives both the FERC and the SLC the information needed to assess the potential environmental impact of the proposed project. To comply with CEQA and NEPA, an EIR/EIS must:

- Identify and assess the potential impact of the proposed project on the environment including any significant environmental effects that cannot be avoided, growth-inducing effects, and any significant cumulative impact resulting from a combination of the effects of the proposed project with those of other past, present, and reasonably anticipated future projects.

- Identify, assess, and recommend reasonable alternatives to the proposed project that would avoid or minimize any adverse environmental effects.

- Identify and recommend specific mitigation measures that would avoid or minimize any significant impact of the proposed project.

- Facilitate public involvement in the EIR/EIS process in order to identify the environmental concerns of private citizens as well as community and agency representatives.

As required by the Federal Endangered Species Act of 1973 (ESA), as amended, the FERC must address the potential effects of a project on federally listed or proposed threatened and endangered species. Under the U.S. Fish and Wildlife Service (FWS) regulations implementing the ESA (50 CFR 402), we are required to ensure that certificated projects are not likely to jeopardize the continued existence of federally listed threatened and endangered species or to result in the destruction or adverse modification of a critical habitat of such species. Similarly, under the California Endangered Species Act (Fish and Game Code Section 2050), the SLC must consult with the California Department of Fish and Game (DFG) to determine whether their projects are likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of habitat essential to the continued existence of the species. If DFG concludes that a project would cause such jeopardy, DFG must identify for the SLC reasonable and prudent alternatives that would avoid the problem.

As required by the National Historic Preservation Act (NHPA), the FERC must address the effects of a project on cultural resources. Section 106 of the NHPA requires us to (1) take into account the effects of the proposed project on properties listed or eligible for listing in the National Register of Historic Places (NRHP), and (2) afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment on the affected properties.

In addition to potential effects on threatened and endangered species, their critical habitat, and historic and cultural resources, an EIR/EIS must assess the possible effects of the proposed project on the following:

- Other biological resources including wildlife, fisheries, wetlands, forests, and riparian habitats.
- Geology, soils, and paleontology including seismic hazards, erosion, and fossil resources.
- Water resources including wetlands, groundwater hydrology, and potable water supplies.
- Land use, recreation, and socioeconomics including temporary population growth and increased employment and tax revenues.
- Air quality and noise.
- Pipeline reliability and safety.

This EIR/EIS is required to describe the affected environment as it currently exists before discussing the environmental consequences of the proposed project and comparing the project's potential impact to that of the alternatives. CEQA and NEPA require us to assess the impact of the construction, operation, and maintenance of the proposed project. As discussed in section 1.1, nonjurisdictional facilities are also addressed in this EIR/EIS.

Public Review and Comment

The EIR/EIS preparation process must also facilitate public involvement in identifying significant environmental impact. Both NEPA and CEQA require us to discover and address concerns the public may have about the proposed project. On April 12, 1994, as described in section 1.2, we issued an NOP/I to all agencies and persons likely to be interested in the proposed project. The NOP/I announced the public scoping meetings, which we conducted in Palo Alto on May 9, in Livermore on May 10, in Fresno on May 11, and in Barstow on May 12, 1994. The purposes of the scoping meetings were to provide state and local agencies and the general public with opportunities to learn more about the proposed project and to comment on the range of environmental issues and concerns that should be addressed in this EIR/EIS. The public scoping facilitated our identifying the important issues in order to focus our analysis for this EIR/EIS and eliminate insignificant issues from detailed study. The total attendance at the four meetings was approximately 88 including 26 speakers. The NOP/I also requested letters of comment by May 20, 1994, and 48 letters were received during the public comment period, which was subsequently extended to June 15, 1994.

We also contacted the planning agency of each jurisdiction in which pipeline facilities would be located for information used in this document. Those contacted included city and county planning departments as well as recreation management agencies such as the East Bay Regional and Livermore park districts and other resource agencies such as the DFG. The results of the public scoping are described in section 1.5.

Approximately 800 copies of the draft EIR/EIS were distributed for comment to various Federal, state, and local agencies, elected officials, environmental groups, public libraries, private citizens, and intervenors to the FERC's proceeding. In addition, approximately 1,200 copies of the Executive Summary were sent to property owners that may be directly affected by the project, and to other environmental groups, organizations, and the media. Those receiving the Executive Summary will have the opportunity to request the draft EIR/EIS; however, this will not extend the comment period.

Public hearings to receive the public's comments on the draft EIR/EIS will take place in the Hunters Point area of San Francisco on February 27, 1995, in Livermore on February 28, 1995, in Fresno on March 1, 1995, and in Barstow on March 2, 1995. Written comments must be received by the FERC on or before March 27, 1995. Comments on this draft EIR/EIS and our responses will appear in the final EIR/EIS.

1.4 PERMIT REQUIREMENTS

In addition to its use by the FERC, the SLC, and the BLM, this EIR/EIS will be used by various other responsible agencies such as Regional Water Quality Control Boards (RWQCBs) in approving the proposed project or the parts of the project that are in their jurisdictions. Table 1.4-1 at the end of section 1 lists the Federal, state, and local permits, licenses, and approvals potentially required for the construction and operation of the proposed project.

1.5 SCOPE OF THE EIR/EIS

1.5.1 Summary of Scoping

As described in section 1.3, public scoping facilitates focusing the EIR/EIS on the issues of concern. Comments made at the scoping meetings and by letter acknowledged the following potential benefits of the proposed project:

- Economic benefits to municipal utilities, industrial users, and other consumers resulting from increased natural gas supply and transportation service options.
- Socioeconomic benefits resulting from construction jobs and increased tax revenues.
- Improved air quality resulting from reducing or eliminating the need to use oil during natural gas curtailments or when required delivery pressures cannot be maintained.

Comments also indicated the following public concerns about the proposed project:

- Routing concerns of private property owners at various locations along the proposed route with suggested route variations such as railroad, surface road, or electric transmission line easements to reduce or eliminate perceived adverse effects.
- PG&E's existing system should be considered as an alternative to the proposed project.
- General pipeline safety on private property and in developed areas and whether additional training or equipment will be needed by local fire departments and emergency response personnel.
- Seismic safety design, particularly near faults such as those in the desert and the Hayward fault.
- Effects of emissions on air quality and of noise from operation of the compressor stations.
- Adverse visual effects resulting from cleared rights-of-way.

- Effects on sensitive areas and resources managed by recreation agencies.
- Effects of building temporary roads that open previously inaccessible areas.
- Effects on water wells, water quality, flood control improvements underground water systems including irrigation systems, potential changes in natural drainage basins, and the source of hydrostatic test water in areas with water shortages.
- Conflicts with the Contra Costa Water District's (CCWD's) plans for the Los Vaqueros Reservoir.
- Conflicts with agricultural operations.
- Availability of pipeline rights-of-way for recreation.
- Effects on future land use and development such as conflicts with the goals of the South Livermore Valley Area Plan.
- Effects on biologic resources, such as wooded wetlands, threatened or endangered species, unique plant and animal habitats and sensitive nesting sites.
- Impacts on oil and gas wells.
- Effects on nonrenewable paleontologic resources and historic and archaeologic sites and features.
- Restoration after construction and how mitigation standards are determined.

Table 1.5.1-1 summarizes the comments received at the scoping meetings and by letter.

1.5.2 Issues Addressed in the EIR/EIS

The proposed loops and Topock, Amboy, and Daggett Compressor Stations would all be sited on or immediately adjacent to existing Mojave facilities that we analyzed previously and that have undergone public scoping, review, and comment as part of the "Mojave-Kern River-El Dorado Natural Gas Pipeline Projects Final Environmental Impact Report/Statement" issued December 18, 1987, (FERC and SLC, 1987). Additional analyses have been issued in the following documents:

- "Mojave-Kern River-WyCal Pipeline Projects Environmental Assessment," issued in January 1990 for the construction of the joint Mojave-Kern River system (FERC and SLC, 1990).
- "Mojave-Kern River Pipeline Projects Environmental Impact Report Amendment," issued in December 1990 (SLC, 1990).
- "Mojave-Kern River Pipeline Projects Environmental Impact Report Final Amendment," issued in February 1991 (SLC, 1991).

TABLE 1.5.1-1

Summary of Comments on the Mojave Northward Expansion Project Received at the Public Scoping Meetings or By Letter

Area of Concern or Issue Raised	Number of Pertinent Comments Received				
	Palo Alto Meeting	Barstow Meeting	Fresno Meeting	Livermore Meeting	By Letter
Routes and easements	1	3	5	8	32
Public safety	1	0	1	0	10
Traffic	0	0	0	0	1
Sensitive species	1	2	0	3	8
Wetlands and vegetation	0	0	0	1	7
Water crossings	0	2	0	2	5
Soils and geology	1	0	0	0	5
Agriculture	0	0	0	1	8
Air	0	2	0	1	5
Noise	0	1	0	0	1
Construction	1	1	3	2	6
Cultural resources	0	0	0	1	7
Jobs and economics	2	1	3	3	13
Land use	0	0	1	2	11
Fish and wildlife	0	0	0	0	7

All of these analyses are incorporated by reference in this EIR/EIS. In this document, we have condensed the previous analyses and combined them with our analysis of Mojave's present project. We have undertaken additional analysis of the proposed facilities in the Mojave Desert only where new information has become available since publication of the Mojave-Kern River EIR/EIS. New information includes additional comments and analysis provided by Federal and state agencies and site-specific field surveys conducted by Mojave. This procedure is intended to make it unnecessary for the reader to review the Mojave-Kern River EIR/EIS to evaluate the environmental impact of the current proposal.

This EIR/EIS addresses the environmental impact of all of the project facilities proposed by Mojave. Our environmental analysis covers all of the issues raised by comments received at the public scoping meetings or by letter as well as concerns identified by us. All of these issues and concerns are addressed in the appropriate sections of this EIR/EIS. Our specific approaches to evaluating the issues are also discussed in their respective sections.

Scope of Nonjurisdictional Facility Analysis

Under Section 7 of the NGA, as part of a decision to certificate facilities, the FERC is required to consider all factors bearing on the public convenience and necessity. The FERC has adopted a four-factor procedure developed by the U.S. Army Corps of Engineers (USACE) in order to determine whether there is sufficient Federal control and responsibility over facilities that are directly related to the project (but are outside of the FERC's jurisdiction) to warrant environmental analysis as part of the jurisdictional facility's proceeding. 2/ The SLC is required by the California Environmental Quality Act (CEQA) to consider the environmental effects of the entire project including associated actions such as nonjurisdictional facilities.

Typically, related nonjurisdictional facilities consist of major facilities such as cogeneration plants or minor facilities such as lateral pipeline connections to end-users. Although Mojave's potential customers consist of local distribution companies (LDCs) and end-use facilities that are either existing or currently under construction, some of them would need to build connecting pipelines to take delivery of the natural gas. We conclude that these connecting pipelines would not be "merely a link" in a larger project but would clearly be the smaller part of the overall project. For this reason, environmental analysis of the related nonjurisdictional facilities is included in this document.

1.5.3 Organization of the EIR/EIS

This EIR/EIS consists of two volumes. In volume I, the proposed Mojave Northward Expansion Project is described in section 2.0 including the pipeline segments and related facilities, land requirements, general construction, operation, and maintenance procedures, safety controls, and Mojave's proposed mitigation measures. The alternatives to the Mojave Northward Expansion Project are described in section 3.0 including both system alternatives and route variations. Section 4.0 describes the affected environment by resource area: geology; soils; water resources; fish and wildlife; endangered and threatened species; vegetation; wetlands; land use, recreation, and public interest areas; socioeconomics; traffic; safety; cultural resources; and air quality and noise. Section 5.0 describes the potential environmental consequences of the proposed project by resource area and includes a discussion of the criteria used to evaluate the effects and identify any significant impact on each resource area. Section

---

2/ See Order Issuing Certificate to Algonquin Gas Transmission Company under Docket No. CP91-1983-000 issued June 2, 1992 (59 FERC ¶ 61, 255).

6.0 then compares the potential environmental consequences of the proposed project with those of the alternatives described in section 3.0, and section 7.0 presents our conclusions and recommendations.

A number of appendices are included at the end of volume I: the FERC staff's Erosion Control, Revegetation, and Maintenance Plan; the Project Revegetation Requirements; the FERC staff's Wetland and Waterbody Construction and Mitigation Procedures; the Biologic Resource Protocols prepared by the FWS and DFG; a list of the references and contacts consulted in preparing this EIR/EIS including where those documents that are cited herein are available to the public; a list of the preparers of this EIR/EIS; a list of the organizations and individuals to whom copies of this draft EIR/EIS were mailed; and a subject index.

Volume II of this EIR/EIS consists of the maps referred to in this volume. At a scale of 1:100,000, the maps show: the routes of the proposed pipeline and alternatives; the sites of compressor stations, meter stations, and block valves; the locations where the routes cross geologic and soil hazards, water resources, vegetative communities, and potential threatened or endangered species habitat; land use designations along the routes; and land ownership along the routes.

Milepost Numbers

The MP numbers cited in the text and tables are from the set of quadrangle maps provided by Mojave and dated August 1994, which show the proposed routes of: (1) the core project to serve the Core Customer Group plus the additional facilities to serve Alternative Customer Group 1 and (2) the same core project but the additional facilities to serve Alternative Customer Group 2. There are two numbers for each MP along portions of these two total project routes because there are currently two alternatives to certain other portions, and these alternatives vary in length. For example, there are two alternatives for routing the pipeline between two points in the southern Central Valley, and the Famoso Alternative is 8.9 miles longer than the Lindsay Alternative. As a result, there are two numbers for each MP on the North Mainline from the point where these two alternatives meet north through the rest of the Central Valley and Bay Area. In the text and tables in this EIR/EIS, wherever this situation exists, the two MP numbers are separated by a slash, e.g., MP 10.9/11.8. The maps in volume II show both sets of MP numbers.

TABLE 1.4-1

Permitting Requirements for the Mojave Northward Expansion Project

Regulatory Agency	Permit/Authority	Action Requiring Permit Approval or Review
FEDERAL		
Federal Energy Regulatory Commission (FERC)	Certificate of Public Convenience and Necessity (Natural Gas Act, Section 7)	Construction, operation, and abandonment of interstate pipeline
Bureau of Land Management (BLM)	Grant of right-of-way (ROW) (Mineral Leasing Act, Section 28)	Construction and operation of pipelines and associated facilities on Federal lands.
	Temporary Use Permit	Temporary work and storage sites at major river crossings, highway and railroad crossings, utility crossings, and temporary access roads
	Compliance with Section 106 of the National Historic Preservation Act	Project activities that will affect NRHP-listed or eligible cultural resources subject to Federal protection requirements
	Fieldwork Authorization Permit (Archaeological Resources Protection Act and FLPMA)	Ground-disturbing activity during Class III cultural resources inventory
Federal Communications Commission (FCC)	Private Land Mobile License	Use of mobile two-way radios
U.S. Fish and Wildlife Service (FWS)	Section 7 Endangered Species Act Consultation	Grant of right-of-way by Federal Land Management Agency (FLMA)
	Fish and Wildlife Coordination Act (FWCA)	Grant of ROW involving aquatic habitats by FLMA
U.S. Environmental Protection Agency (EPA), Region IX	Prevention of Significant Deterioration (PSD), Clean Air Act	Construction and operation of new or modified compressor stations (for Topock, AZ, only and includes Arizona authority to construct)
Bureau of Reclamation	Perpetual license or easement	Construction and operation of pipeline crossings of federally owned or controlled ditches, canals, and drainages in conjunction with local water districts
Advisory Council on Historic Preservation (ACHP)	Compliance with Section 106 of NHPA	Project activities that will affect cultural resources listed or eligible for listing on the National Register of Historic Places (NRHP)
Bureau of Alcohol, Tobacco and Firearms	Explosive User's Permit	Purchase, storage, and use of explosives for project construction
Federal Highway Administration	Encroachment Permit	Construction and operation of pipeline across federally-funded highways
U.S. Army Corps of Engineers (USACE)	Section 404 and Section 10 Permits	Pipeline construction across rivers, streams, and wetlands

TABLE 1.4-1 (cont'd)

Regulatory Agency	Permit/Authority	Action Requiring Permit Approval or Review
STATE OF CALIFORNIA		
Department of Fish and Game (DFG)	Compliance with California Endangered Species Act	Pipeline and compressor station construction
	Stream Alteration Agreement (1603)	Alteration of the natural state of any stream
Department of Transportation (CalTrans)	Encroachment Permit (crossing of state highways)	Crossing of highways in California; encroachment by pipeline within, under, or over state highway ROWs
State Lands Commission (SLC)	CEQA compliance	Construction, operation, and maintenance of all project facilities in California
	ROW permit	Any crossing of sovereign lands
California State Water Resources Control Board (CSWRCB), Regional Board	National Pollutant Discharge Elimination System (NPDES) Permit	Discharge of hydrostatic test water into any surface waters of the state
	Section 401 Water Quality Certification	Pipeline construction across rivers, streams, and wetlands
	Report of Waste Discharge	Discharge of hydrostatic test waters onto lands, dry water courses, or lakebeds, especially if the test water is contaminated with pollutants of concern to the regional board; if the test water is not contaminated and will be disposed in a manner that reduces or eliminates soil erosion, this permit may not be required
CSWRCB Division of Water Rights	Temporary Permit to Appropriate Water	Projects that propose to divert water from a surface stream or other body of water for use on nonriparian land or to store unappropriated surface water seasonally
Various water districts	Encroachment Permit	Crossing of water district facilities (i.e., water supply pipelines and certain water bodies)
State Office of Historic Preservation	Compliance with Section 106 of NHPA	Project activities that will affect NRHP-listed or eligible cultural resources
San Francisco Bay Conservation and Development Commission	Use Permit	If development occurs within the zone between 6.1 and 6.2 national geodetic vertical datum and 100 feet upland or 100 feet into the Bay
Bay Area Air Quality Management District	Consultation/conformity analysis	Construction within air basin
Mojave Desert Air Quality Management District	Authority to Construct, Permit to Operate, consultation/conformity analysis	Emissions of precursors to ozone formation (i.e., NO_x)
Sacramento Metropolitan Air Quality Management District	Consultation/conformity analysis	Construction within air basin
San Joaquin Valley Unified Air Pollution Control District	Authority to Construct, Permit to Operate, consultation/conformity analysis	Emissions of precursors to ozone formation (i.e., NO_x)

TABLE 1.4-1 (cont'd)

Regulatory Agency	Permit/Authority	Action Requiring Permit Approval or Review
STATE OF ARIZONA		
Department of Environmental Quality, Office of Air Quality	Modification to existing permit to operate	Operation of the modified Topock Compressor Station
Office of the Fire Marshall	Storage Tank Permit	Use of any tank to hold substances other than water
ARIZONA COUNTIES		
Mohave County		
Planning Department	Zoning Use Permit	Modification of Topock Compressor Station
CALIFORNIA COUNTIES		
Alameda County		
Public Works Department	Road Encroachment Permit	Crossing of county roads or alignment within county ROWs
	County Watercourse Permit	Crossing any natural waterway
Contra Costa County		
Road Department	Road Encroachment Permit	Crossing of county roads or alignment within county ROWs
Planning Department	Conditional Use Permit	Use of former railroad ROW
Fresno County		
Public Works Department, Maintenance and Operations	Road Encroachment Permit	Crossing of county roads or alignment within county ROWs
Planning Department	Conditional Use Permit	Land uses other than those permitted in the specific land use zones
Kern County	Road Encroachment Permit	Crossing of county roads or alignment within county ROWs
Kings County		
Public Works Department	Road Encroachment Permit	Crossing of county roads or alignment within county ROWs
Planning Department	Conditional Use Permit	Land uses other than those permitted in the specific land use zones
Madera County		
Road Department	Road Encroachment Permit	Crossing of county roads or alignment within county ROWs
Planning Department	Conditional Use Permit	Land uses other than those permitted in the specific land use zones

TABLE 1.4-1 (cont'd)

Regulatory Agency	Permit/Authority	Action Requiring Permit Approval or Review
Merced County		
Public Works Department	Road Encroachment Permit	Crossing of county roads or alignment within county ROWs
Planning Department	Conditional Use Permit	Aboveground facilities
Sacramento County		
Public Works Department	Road Encroachment Permit	Crossing of county roads or alignment within county ROWs
Planning Department	Conditional Use Permit	Aboveground Facilities
San Bernardino County		
Public Works Department	Road Encroachment Permit	Crossing of county roads or alignment within county ROWs
Planning Department	Conditional Use Permit	Land uses other than those permitted in the specific land use zones
San Joaquin County		
Public Works Department	Road Encroachment Permit	Crossing of county roads or alignment within county ROWs
Planning Department	Improvement Plan	Required for utility transmission lines and aboveground facilities
Santa Clara County		
Central Permits Office	Road Encroachment Permit	Crossing of county roads or alignment within county ROWs
Planning Department	Conditional Use Permit	Aboveground facilities
Solano County		
Transportation Department	Road Encroachment Permit	Crossing of county roads or alignment within county ROWs
Stanislaus County		
Public Works Department	Road Encroachment Permit	Crossing of county roads or alignment within county ROWs
Tulare County		
Public Works Department	Road Encroachment Permit	Crossing of county roads or alignment within county ROWs
CITIES CROSSED BY PIPELINE (See Map Volume)	Encroachment Permit	City road crossings
	Conditional Use Permit	Pipeline location within city limits or not located within the public ROW

2.0 DESCRIPTION OF THE PROPOSED PROJECT

2.1 DESCRIPTION OF EXISTING OPERATIONS

Mojave is currently transporting natural gas into Southern California through its existing pipeline system, which begins near Topock, Arizona, and terminates near Bakersfield in Kern County, California. The Mojave pipeline system consists of certain facilities that are owned solely by Mojave and other facilities that are owned jointly by Mojave and the Kern River Gas Transmission Company (Kern River). Mojave's solely owned pipeline facilities extend from Topock to a point near Daggett, California, and are referred to as the Mojave Mainline. The jointly owned facilities include the Commonline, the East Side Lateral, and the West Side Lateral. The Mojave Mainline currently has only one compressor station, located in Topock. The Mojave Mainline receives natural gas from El Paso Natural Gas Company and Transwestern Pipeline Company and serves one customer in Hector, California. At Daggett, the Mojave Mainline gas supply is joined by gas supplied by Kern River from sources in the Rocky Mountains. Together, Mojave and Kern River serve 19 customers between Daggett and Bakersfield.

In a separate application, Kern River requested authorization to increase its capacity by 452 MMcf/d. Kern River's expansion would have a minor effect on Mojave's proposed expansion, requiring the construction of additional loop pipeline along the Commonline and East Side Lateral and a reduction in the amount of compression Mojave would install at Daggett. Kern River's expansion project was the subject of a separate FERC environmental assessment issued for comment in April 1993.

In its Preliminary Determination issued November 18, 1994, the FERC determined that Kern River's proposed expansion is not ready to go forward or be reviewed at this time. For this reason, the FERC dismissed, without prejudice, the portion of Mojave's facilities that were added to the project solely to accommodate the possibility of a concurrent Kern River expansion. These additional facilities consist of 43.9 miles out of the total 100.1 miles of loops. Because of timing, this draft EIR/EIS addresses these additional facilities. If no change occurs in the status of the Kern River expansion, the sections addressing these additional facilities will be removed from the final EIR/EIS.

2.2 DESCRIPTION OF THE PROPOSED FACILITIES

As shown in figure 2.2-1, Mojave's proposed expansion would extend its existing system northward from the Sycamore Meter Station on the East Side Lateral to the Sacramento and San Francisco Bay areas. In addition to the proposed North and Sacramento Mainlines, Mojave would construct various laterals, loops, compressor stations, and add compression at the existing Topock Compressor Station. Figure 2.2-2 illustrates the types of facilities included in the project: buried pipeline of various diameters, aboveground compressor stations, meter stations, and block valves. Figures 2.2-3 and 2.2-4 are typical compressor and meter station site plans. The customers that would be served are industrial and manufacturing companies, electric cogeneration plants, and municipalities. In addition, to the Core Customer Group to be served by the project, Mojave is negotiating with two other groups of customers, only one of which would be served in addition to the Core Customer Group. The facilities to be built would depend on the locations of these additional customers. We analyzed the impact of all of the facilities that would be required to serve all of the potential additional customers even though not all of the facilities would actually be built (see section 3).

THIS PAGE INTENTIONALLY BLANK

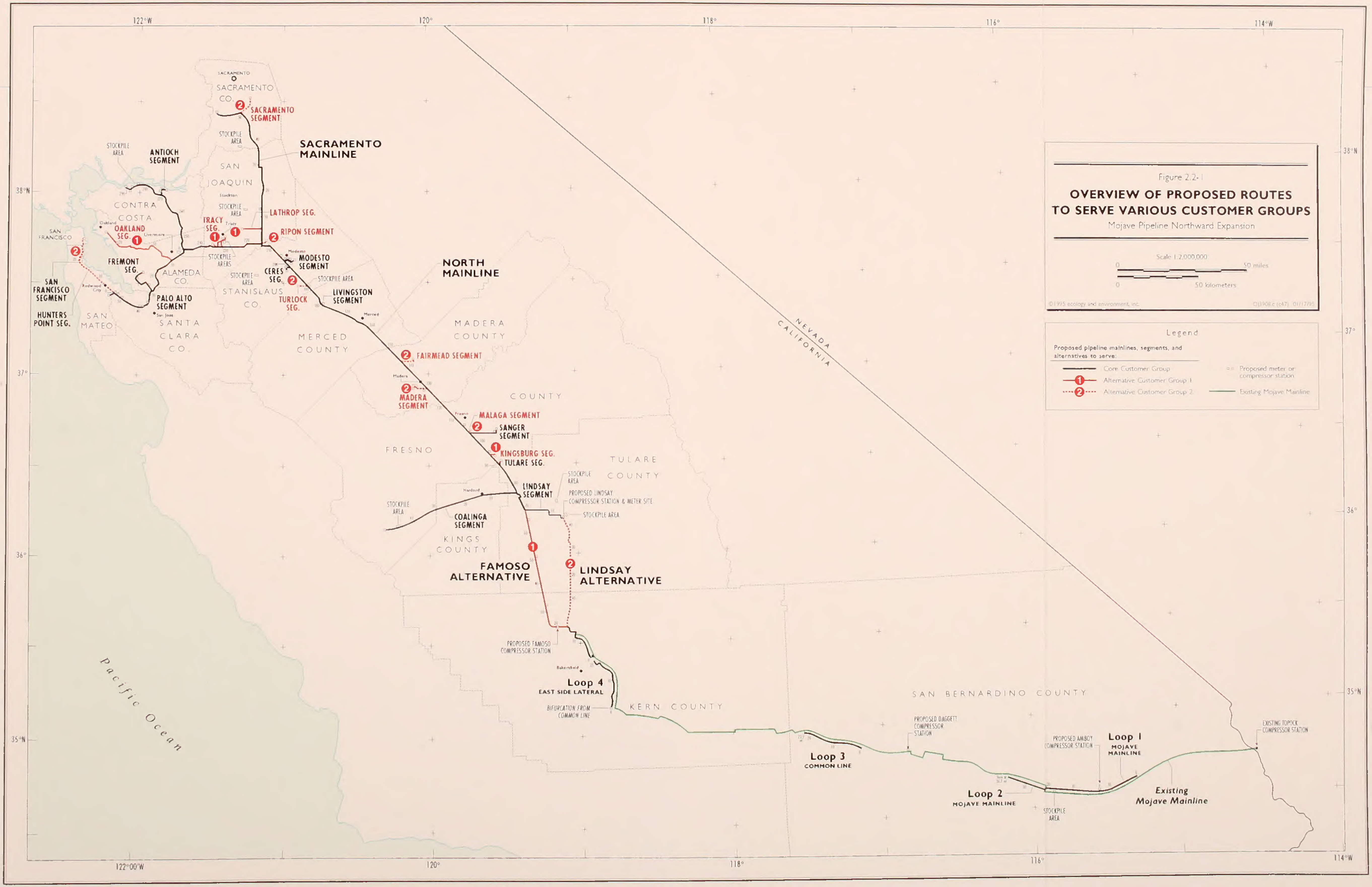
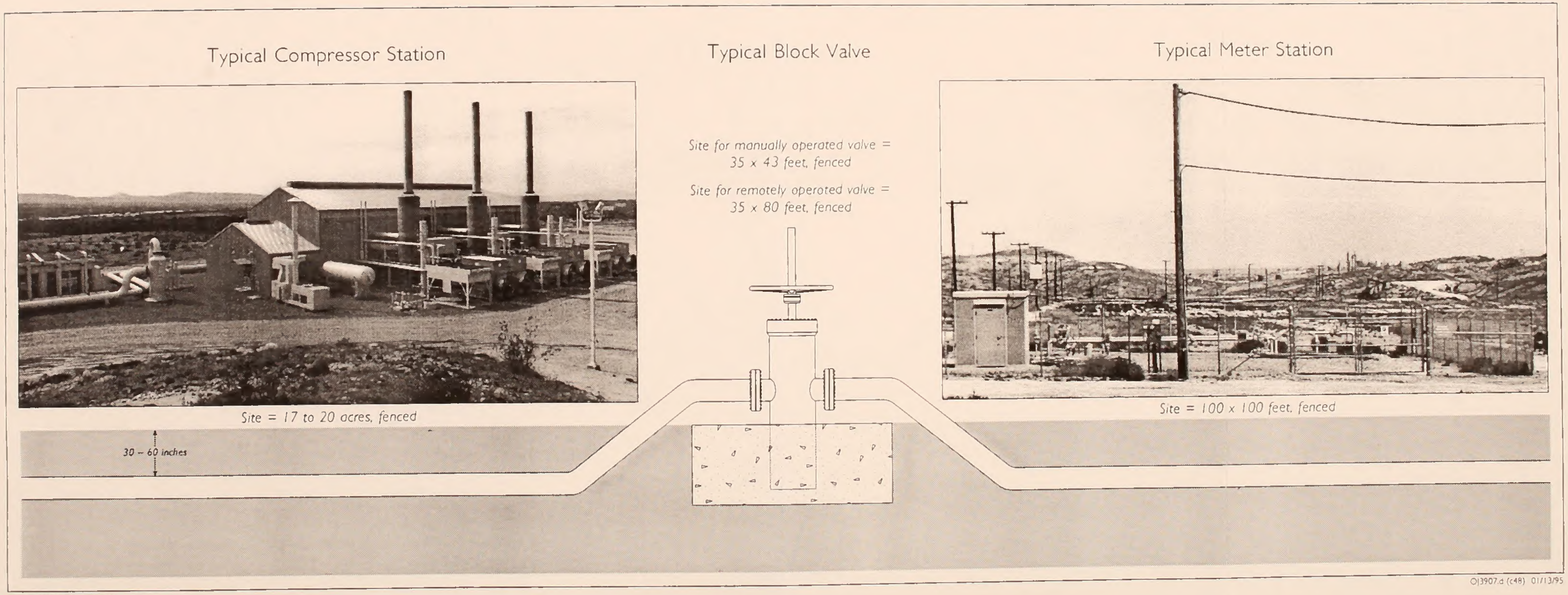


Figure 2.2-1

OVERVIEW OF PROPOSED ROUTES TO SERVE VARIOUS CUSTOMER GROUPS

Mojave Pipeline Northward Expansion

Scale 1:2,000,000
0
50 miles
0
50 kilometers
Legend
Proposed pipeline mainlines, segments, and alternatives to serve:
Core Customer Group
Alternative Customer Group 1
Alternative Customer Group 2
Proposed meter or compressor station
Existing Mojave Mainline
122°W
120°
118°
116°
114°W
122°00'W
38°N
37°
36°
35°N
SACRAMENTO
SACRAMENTO CO.
SACRAMENTO SEGMENT
SACRAMENTO MAINLINE
STOCKPILE AREA
ANTIOCH SEGMENT
SAN JOAQUIN
Stockton
CONTRA COSTA
LATHROP SEG.
TRACY SEG.
Tracy
RIPON SEGMENT
Oakland
OAKLAND SEG.
Livermore
SAN FRANCISCO
FREMONT SEG.
STOCKPILE AREAS
ALAMEDA CO.
Modesto
MODESTO SEGMENT
CERES SEG.
STOCKPILE AREA
SAN FRANCISCO SEGMENT
Redwood City
PALO ALTO SEGMENT
STANISLAUS CO.
TURLOCK SEG.
LIVINGSTON SEGMENT
HUNTERS POINT SEG.
SAN MATEO
San Jose
SANTA CLARA CO.
Merced
MERCED COUNTY
NORTH MAINLINE
MADERA COUNTY
FAIRMEAD SEGMENT
Madera
MADERA SEGMENT
Fresno
MALAGA SEGMENT
SANGER SEGMENT
FRESNO COUNTY
KINGSBURG SEG.
TULARE SEG.
TULARE COUNTY
Hanford
LINDSAY SEGMENT
STOCKPILE AREA
PROPOSED LINDSAY COMPRESSOR STATION & METER SITE
COALINGA SEGMENT
KINGS COUNTY
FAMOSO ALTERNATIVE
LINDSAY ALTERNATIVE
PROPOSED FAMOSO COMPRESSOR STATION
Bakersfield
Loop 4
EAST SIDE LATERAL
BIFURCATION FROM COMMON LINE
KERN COUNTY
NEVADA
CALIFORNIA
SAN BERNARDINO COUNTY
Loop 3
COMMON LINE
PROPOSED DAGGETT COMPRESSOR STATION
PROPOSED AMBOY COMPRESSOR STATION
Loop 1
MOJAVE MAINLINE
Loop 2
MOJAVE MAINLINE
STOCKPILE AREA
Existing Mojave Mainline
EXISTING TOPOCK COMPRESSOR STATION
Pacific Ocean
©1995 ecology and environment, inc.
OJ3908.c (c47) 01/17/95


Typical Compressor Station
Typical Block Valve
Typical Meter Station
Site for manually operated valve = 35 x 43 feet, fenced
Site for remotely operated valve = 35 x 80 feet, fenced
Site = 17 to 20 acres, fenced
Site = 100 x 100 feet, fenced
30 – 60 inches

OJ3907.d (c48) 01/13/95

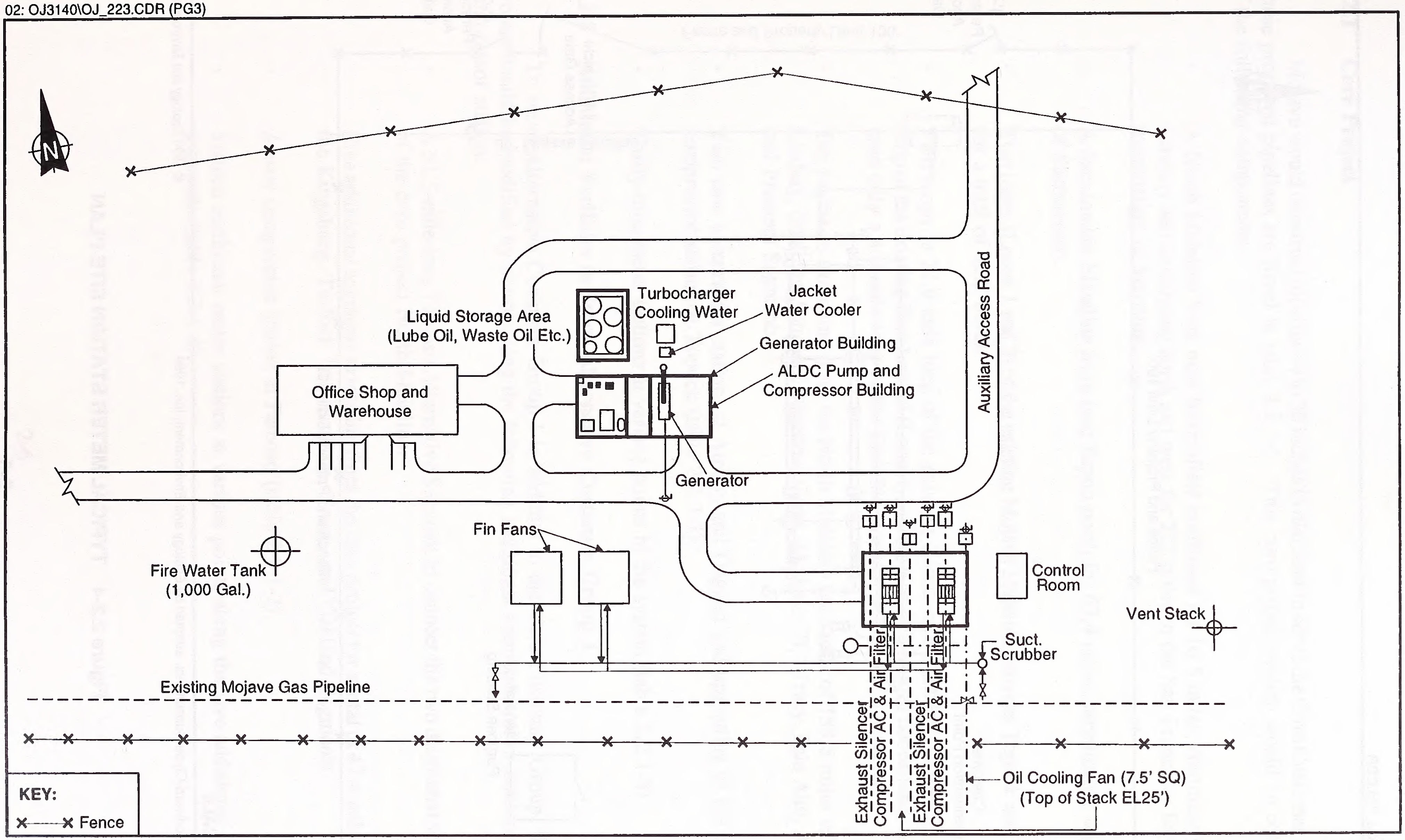
ecology and environment, inc.

not to scale

Figure 2.2-2

Typical Project Facilities

02: OJ3140\OJ_223.CDR (PG3)

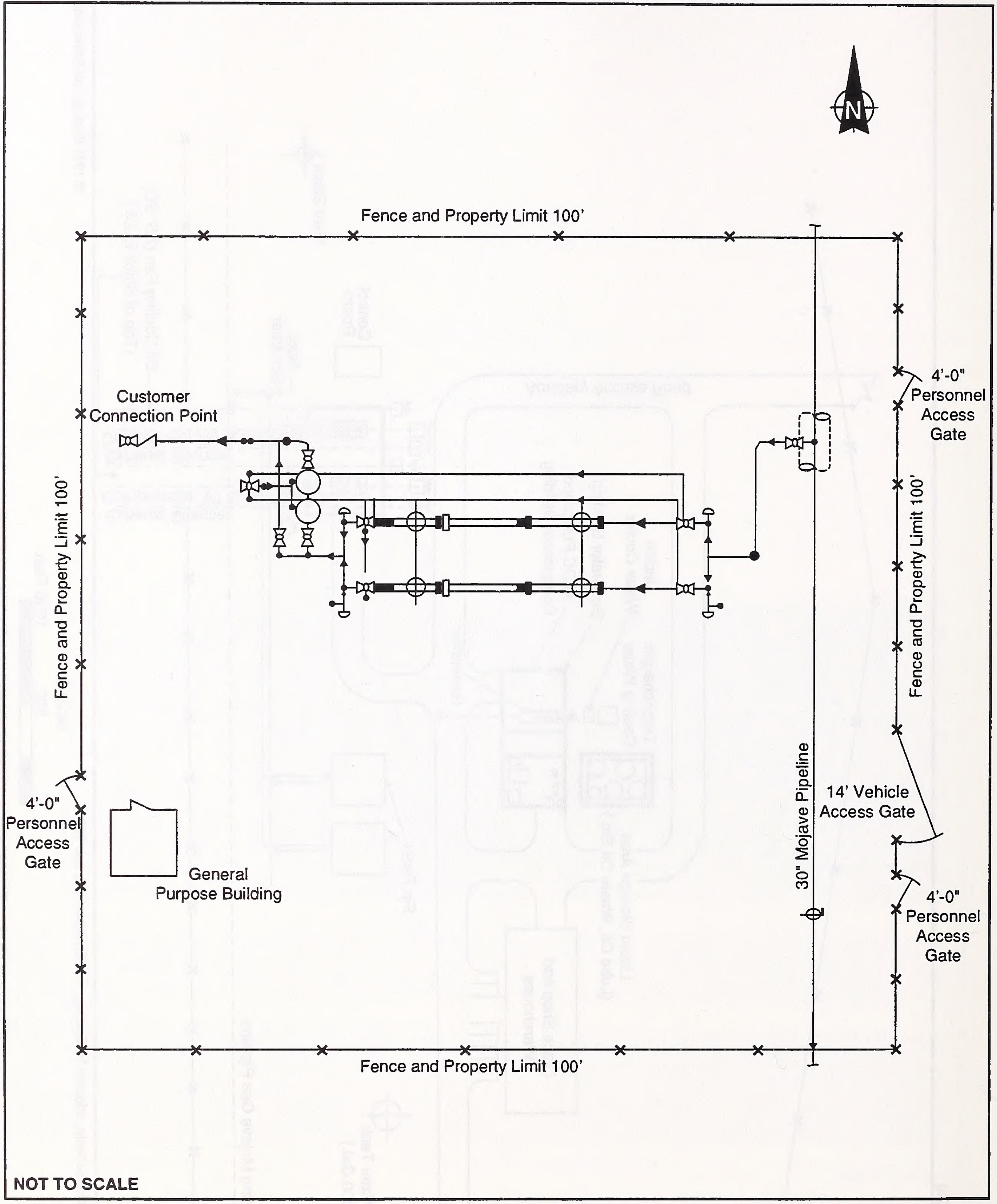

N
Liquid Storage Area
(Lube Oil, Waste Oil Etc.)
Turbocharger
Cooling Water
Jacket
Water Cooler
Generator Building
ALDC Pump and
Compressor Building
Auxiliary Access Road
Office Shop and
Warehouse
Generator
Fin Fans
Fire Water Tank
(1,000 Gal.)
Control
Room
Vent Stack
Suct.
Scrubber
Existing Mojave Gas Pipeline
Exhaust Silencer
Compressor AC & Air Filter
Exhaust Silencer
Compressor AC & Air Filter
Oil Cooling Fan (7.5' SQ)
(Top of Stack EL25')
KEY:
Fence
SCALE
0
800
1600 Feet

SOURCE: Woodward-Clyde Consultants, adapted by Ecology and Environment, Inc. 1994

© 1994 Ecology and Environment, Inc.

Figure 2.2-3 TYPICAL COMPRESSOR STATION SITE PLAN (DAGGETT)

02: OJ3140\OJ_224.CDR


N
Fence and Property Limit 100'
Customer Connection Point
4'-0" Personnel Access Gate
Fence and Property Limit 100'
Fence and Property Limit 100'
4'-0" Personnel Access Gate
General Purpose Building
30" Mojave Pipeline
14' Vehicle Access Gate
4'-0" Personnel Access Gate
Fence and Property Limit 100'
NOT TO SCALE

SOURCE: Woodward-Clyde Consultants, adapted by Ecology and Environment, Inc. 1994

© 1994 Ecology and Environment, Inc.

Figure 2.2-4 TYPICAL METER STATION SITE PLAN

2.2.1 Core Project

Mojave would construct pipelines 4 to 30 inches in diameter to serve the Core Customer Group. These proposed pipelines are listed in table 2.2.1-1. This core project system would be composed of the following components:

- A North Mainline from near Bakersfield northwest for 16.5 miles, resuming west of Lindsay and continuing north and west for 222 miles to the San Francisco Bay Area, terminating in Martinez.
- A Sacramento Mainline from near Ripon north for 63.4 miles, terminating southwest of Sacramento.
- Two loops (Loops 1 and 2) of the existing Mojave Mainline between Topock and Daggett for a total of 52.2 miles.
- Two loops, a 22.9-mile loop of the existing Commonline (Loop 3) and a 25.0-mile loop of the existing East Lateral (Loop 4), unless Kern River does not expand, in which case only a 4.0-mile loop of the East Side Lateral would be constructed.
- Ten segments extending from the North Mainline for a total of 158.8 miles called the Lindsay, Coalinga, Sanger, Livingston, Ceres, Modesto "B," Tracy, Palo Alto, Antioch, and Fremont Segments.
- Two new compressor stations at Amboy and Daggett and upgrading of the existing compressor station at Topock (table 2.2.1-2).
- Thirty-nine meter stations at various points in the system (table 2.2.1-3).

2.2.2 Additional Facilities to Serve Alternative Customer Group 1

To serve Alternative Customer Group 1 in addition to the Core Customer Group, the core project would be modified by constructing the following additional segments, meter stations, and a compressor station:

- A 51.5-mile-long Famoso Alternative Segment to connect the two disjointed segments of the core project North Mainline.
- Five additional segments extending from the core project for a total of 47.4 miles called the Kingsburg, Turlock "A," Lathrop, Tracy, and Oakland Segments.
- A new compressor station at Famoso (table 2.2.1-2).
- Sixteen additional meter stations at various points along the five additional pipeline segments (table 2.2.1-3).

TABLE 2.2.1-1

Proposed Pipeline Segments for Core and Additional Customer Groups

Pipeline Segment	Counties Crossed	Pipeline Diameter (inches)	Pipeline Length (miles)	In or Next to Existing ROW (percent)
Core Project				
North Mainline	Kern, Tulare, Fresno, Madera, Merced, Stanislaus	30	164.3	64
	San Joaquin, Stanislaus, Alameda	20	31.3	64
	Contra Costa, Alameda	12	26.1 a/	64
	Contra Costa	10	16.8 b/	64
Sacramento Mainline	San Joaquin	16	13.4	78
	San Joaquin, Sacramento	12	50.0	78
Lindsay Segment	Tulare	6 c/	17.1	88
Coalina Segment	Tulare, Kings, Fresno	10	52.5	100
Sanger Segment	Fresno	6	11.2	100
Livingston Segment	Merced	4	0.2	100
Ceres Segment	Stanislaus	4	2.2	100
Modesto B Segment	Stanislaus	6	4.7	83
Tracy Segment	San Joaquin	12	1.9 d/	76
Palo Alto Segment	Alameda, Santa Clara	12 e/	49.0	47
Antioch Segment	Contra Costa	10	4.4	89
Fremont Segment	Alameda	4	15.6	99
Loop 1 (Mojave Mainline)	San Bernardino	30	15.5	100
Loop 2 (Mojave Mainline)	San Bernardino	30	36.7	100
Loop 3 (Commonline)	San Bernardino	30	22.9 f/	100
Loop 4 (East Side Lateral)	Kern	30	25.0 f/	100
Additional Facilities to Serve Alternative Customer Group 1				
Famoso Alternative Segment	Kern, Tulare	30	51.5	78
Kingsburg Segment	Fresno	4	0.4	100
Turlock A Segment	Stanislaus	4	3.2	100
Lathrop Segment	San Joaquin	6	8.2	100
Tracy Segment	San Joaquin	6	3.9	76
Oakland Segment	Alameda	8	31.7	90
Additional Facilities to Serve Alternative Customer Group 2				
Lindsay Alternative Segment	Kern, Tulare	30	42.6	100
McFarland Segment	Kern	8	9.4	100
Malaga Segment	Fresno	6	0.7	0
Madera Segment	Madera	4	6.2	84
Fairmead Segment	Madera	4	5.0	86
Turlock Segment	Stanislaus	4	3.4	100
Ripon Segment	San Joaquin	6	2.0	80
Sacramento Segment (A-159)	Sacramento	12	7.5	99
Tracy Segment (A-160)	San Joaquin	12	3.6	63
Tracy Segment (A-161)	San Joaquin	4	1.9	0
Antioch Segment (A-174)	Contra Costa	10	4.9	100
Martinez Segment (A-172)	Contra Costa	10	1.0	100
Hunters Point Segment	Santa Clara, San Mateo, San Francisco	12	30.1	99
San Francisco Segment	San Mateo	6	1.5	100

TABLE 2.2.1-1 (cont'd)

---

a/ To serve Alternative Customer Group 1, 12.0 miles of the North Mainline would be reduced from 20 to 12 inches in diameter.
b/ To serve Alternative Customer Group 1, the 10-inch-diameter North Mainline would be extended 1.1 miles to 17.8 miles.
c/ To serve Alternative Customer Group 2, the diameter of the Lindsay Segment would be increased to 30 inches and become part of the North Mainline.
d/ To serve Alternative Customer Group 2, the Tracy Segment would be extended 0.3 mile to 2.2 miles.
e/ To serve Alternative Customer Group 2, 17.7 miles of the Palo Alto Segment would be increased to 20 inches in diameter.
f/ Only if Kern River expands coincidentally with Mojave; if only Mojave expands, Loop 3 would not be built, and Loop 4 would only be 4.0 miles long.

Table 2.2.1-2

Proposed Compressor Stations

Station	New Horsepower	Added Horsepower	Compressor Drive Type	Milepost Location	County
Topock	–	24,470	Gas Turbine	0 a/	Mohave, AZ
Amboy	21,258	–	Gas Turbine	65.5 a/	San Bernardino, CA
Daggett	31,500 b/	–	Electric Motor	19.1 c/	San Bernardino, CA
Famoso d/	20,330	–	Gas Turbine	19.6 e/	Kern, CA
Lindsay f/	26,000	–	Electric Motor	42.6 g/	Tulare, CA

---

a/ On Mojave Mainline.
b/ Only if Mojave expands; if Kern River expands coincidentally with Mojave, the Daggett Station would get 21,000 hp of new horsepower.
c/ On Commonline.
d/ Alternative Customer Group 1 only.
e/ On Mojave North Mainline.
f/ Alternative Customer Group 2 only.
g/ On Lindsay Alternative Segment.

TABLE 2.2.1-3

Proposed Meter Stations

Pipeline Segment	Meter Station a/	Milepost	County	Land Use
North Mainline	Bakersfield A	7.5	Kern	Rangeland
	Bakersfield B	16.3	Kern	Agricultural
	McFarland	25.6	Kern	Agricultural
	Delano b/	31.4	Kern	Industrial/Agricultural
	Pixley b/	50.8	Tulare	Agricultural
	Tulare b/	65.5	Tulare	Agricultural
	Tulare C c/	85.6	Tulare	Agricultural
	Selma	94.7/103.5	Fresno	Agricultural
	Fresno	108.8/117.4	Fresno	Agricultural/Industrial
	Madera b/	129.9	Madera	Agricultural/Commercial
	Turlock C b/	190.6	Stanislaus	Agricultural
	Modesto F	203.9/212.6	Stanislaus	Residential/Commercial
	Modesto G	205.8/214.5	Stanislaus	Industrial
	Martinez A	287.3/296.2	Contra Costa	Industrial
	Martinez B	288.0/296.9	Contra Costa	Industrial
	Martinez C	291.0/299.9	Contra Costa	Industrial/Open land
Lindsay Segment	Lindsay	17.1	Tulare	Commercial/Industrial
Kingsburg Segment	Kingsburg b/	0.4	Fresno	Agricultural
Coalinga Segment	Hanford A	11.9	Kings	Residential/Commercial
	Hanford B	13.3	Kings	Agricultural
	Lemoore A	20.9	Kings	Agricultural
	Lemoore B	21.0	Kings	Agricultural
	Coalinga	52.5	Fresno	Agricultural
Sanger Segment	Malaga b/	0.6	Fresno	Agricultural
	Sanger A	11.2	Fresno	Agricultural
	Sanger B	11.0	Fresno	Agricultural/Commercial
Malaga Segment	Malaga A c/	0.4	Fresno	Agricultural
	Malaga B c/	0.7	Fresno	Agricultural
Madera Segment	Madera A c/	4.9	Madera	Agricultural/Industrial
	Madera B c/	6.0	Madera	Industrial
	Madera C c/	6.2	Madera	Industrial
	Madera D c/	1.8	Madera	Agricultural/Industrial
Livingston Segment	Livingston	0.2	Merced	Residential
Fairmead Segment	Fairmead	5.0	Madera	Open land
	Turlock A b/	3.2	Stanislaus	Agricultural
	Turlock c/	3.4	Stanislaus	Agricultural
Ceres Segment	Ceres A	1.3	Stanislaus	Agricultural/Industrial
	Ceres B	2.2	Stanislaus	Agricultural/Industrial
Modesto B Segment	Modesto B	1.4	Stanislaus	Industrial
	Modesto C	2.3	Stanislaus	Industrial
	Modesto D	4.0	Stanislaus	Industrial/Agricultural
	Modesto E	4.7	Stanislaus	Industrial/Agricultural
Ripon Segment	Ripon c/	2.0	San Joaquin	Industrial
Tracy Segment	Tracy C	4.5	San Joaquin	Industrial
	Tracy D	5.8	San Joaquin	Industrial
	Tracy A b/	1.0	San Joaquin	Industrial
	Tracy B b/	1.9	San Joaquin	Agricultural
Tracy A-160 Segment	Tracy A c/	0.9	San Joaquin	Industrial

TABLE 2.2.1-3 (cont'd)

Pipeline Segment	Meter Station a/	Milepost	County	Land Use
Tracy A-161 Segment	Tracy B c/	1.9	San Joaquin	Industrial
Palo Alto Segment	Santa Clara A	29.7	Santa Clara	Agricultural
	Santa Clara B	33.3	Santa Clara	Industrial
	Santa Clara C c/	34.0	Santa Clara	Industrial
	Palo Alto A	46.0	Santa Clara	Residential
	Palo Alto B	49.0	Santa Clara	Commercial
	Palo Alto C c/	44.6	Santa Clara	Residential
	Palo Alto D c/	46.9	Santa Clara	Residential
Oakland Segment	San Leandro b/	26.0	Alameda	Industrial
	Oakland b/	31.7	Alameda	Industrial
Fremont Segment	Fremont A	11.4	Alameda	Industrial
	Fremont B	15.6	Alameda	Industrial
	Fremont C	3.0	Alameda	Industrial
Antioch Segment	Antioch A	4.4	Contra Costa	Industrial
	Antioch B b/	2.8	Contra Costa	Industrial
	Antioch C c/	2.5	Contra Costa	Industrial
	Antioch C b/	2.1	Contra Costa	Industrial
Antioch A-174 Segment	Antioch B c/	4.9	Contra Costa	Industrial
Hunters Point Segment	Hunters Point c/	30.1	San Francisco	Industrial
San Francisco Segment	San Francisco c/	1.5	San Mateo	Industrial
Sacramento Mainline	Ripon b/	0.1	San Joaquin	Agricultural
	Stockton	13.4	San Joaquin	Agricultural
	Lodi	31.3	San Joaquin	Agricultural
	Sacramento B	63.4	Sacramento	Agricultural
Sacramento A-159 Segment	Sacramento A c/	7.5	Sacramento	Industrial
Lathrop Segment	Lathrop b/	8.2	San Joaquin	Industrial

---

a/ A total of 74 meter stations are listed; to serve the Core Customer Group and Alternative Customer Group 1, 55 meter stations would be built; to serve the Core Customer Group and Alternative Customer Group 2, 58 meter stations would be built.

b/ To serve Alternative Customer Group 1 only.

c/ To serve Alternative Customer Group 2 only.

2.2.3 Additional Facilities to Serve Alternative Customer Group 2

To serve Alternative Customer Group 2 instead of Group 1, the core project would be modified by adding the following components:

- A 42.6-mile-long Lindsay Alternative Segment to connect the southern segment of the core project North Mainline with the Lindsay Segment.
- Thirteen additional segments extending from the core project for a total of 77.2 miles called the McFarland, Malaga, Madera, Fairmead, Turlock, Ripon, Sacramento (A-159), Tracy (A-160), Tracy (A-161), Antioch (A-174), Martinez (A-172), Hunters Point, and San Francisco Segments.
- A 0.3-mile-long extension to the Tracy Segment.
- A new compressor station at Lindsay (table 2.2.1-2).
- Nineteen additional meter stations at various points along the additional pipeline segments (table 2.2.1-3).

The diameters of certain pipeline segments would also be changed.

2.2.4 Nonjurisdictional Facilities

The nonjurisdictional facilities associated with the proposed project are the pipelines that customers would need to construct to take delivery of the natural gas transported by the Mojave Northward Expansion Project. According to Mojave, five potential customers would most likely need to construct connecting pipelines. Although we do not know the identities of these potential customers, Mojave has provided an estimate of the necessary facilities and probable interconnection locations based on standard pipeline design and engineering considerations. The five facilities are:

- Nonjurisdictional Facility A — This would be a 2.2-mile-long, 4-inch-diameter pipeline west from the North Mainline at MP 10.2. It would terminate in what appears to be an industrial oil well patch area.
- Nonjurisdictional Facility B — This would be a 0.6-mile-long, 4-inch-diameter pipeline east from the Lindsay Alternative at MP 10. It would terminate in what appears to be an industrial oil area.
- Nonjurisdictional Facility C — This would be a 3.8-mile-long, 4-inch-diameter pipeline south from the Coalinga Segment at MP 13.2. It would terminate on Idaho Avenue south of Hanford in what appears to be a rural area.
- Nonjurisdictional Facility D — This would be a 14-mile-long, 6-inch-diameter pipeline west from the Sacramento Mainline at MP 27.7. It would terminate at or near the White Slough water pollution control plant in what appears to be an industrial area near Stockton.

- Nonjurisdictional Facility E — This would be an 11-mile-long, 8-inch-diameter pipeline west from the Sacramento Mainline at MP 15.5. It would terminate north of the turning basin on the San Joaquin River in what appears to be an industrial/residential area near Sacramento.

Because it is too early in the project development to specifically identify the facilities that the potential customers might construct or the exact routes where the facilities would be located, further environmental analysis at this time is premature. We are attempting to obtain more definite information for inclusion in the final EIR/EIS to meet the requirements of the FERC and SLC.

2.3 LAND REQUIREMENTS

2.3.1 Pipeline Rights-of-Way and Additional Construction Work Areas

Mojave intends to bury its pipeline within or adjacent to existing railroad and surface road rights-of-way for almost 80 percent of the proposed pipeline route. Much of the North Mainline would be within the Southern Pacific (SP) railroad right-of-way where it parallels California State Route 99 through the San Joaquin Valley. Figure 2.3.1-1 shows the location of the pipeline at the edge of or, pending the outcome of negotiations with the railroad, just outside of the existing 100-foot-wide right-of-way; therefore, we evaluated environmental resources both within and adjacent to the SP right-of-way. The pipeline would be under the pavement or in the shoulder of streets in most residential areas.

The width of the construction right-of-way would generally be based on the diameter of the pipeline. Pipe 4 to 8 inches in diameter would require a construction right-of-way up to 30 feet wide, 10- to 16-inch pipe would require up to 65 feet wide, and 20- to 30-inch pipe would require up to 75 feet wide. Because relatively level work spaces are needed for trench excavation equipment, wider construction rights-of-way may be needed on steep grades and in areas of excessive side slope. Figure 2.3.1-2 depicts the construction right-of-way on both even and sloping terrain.

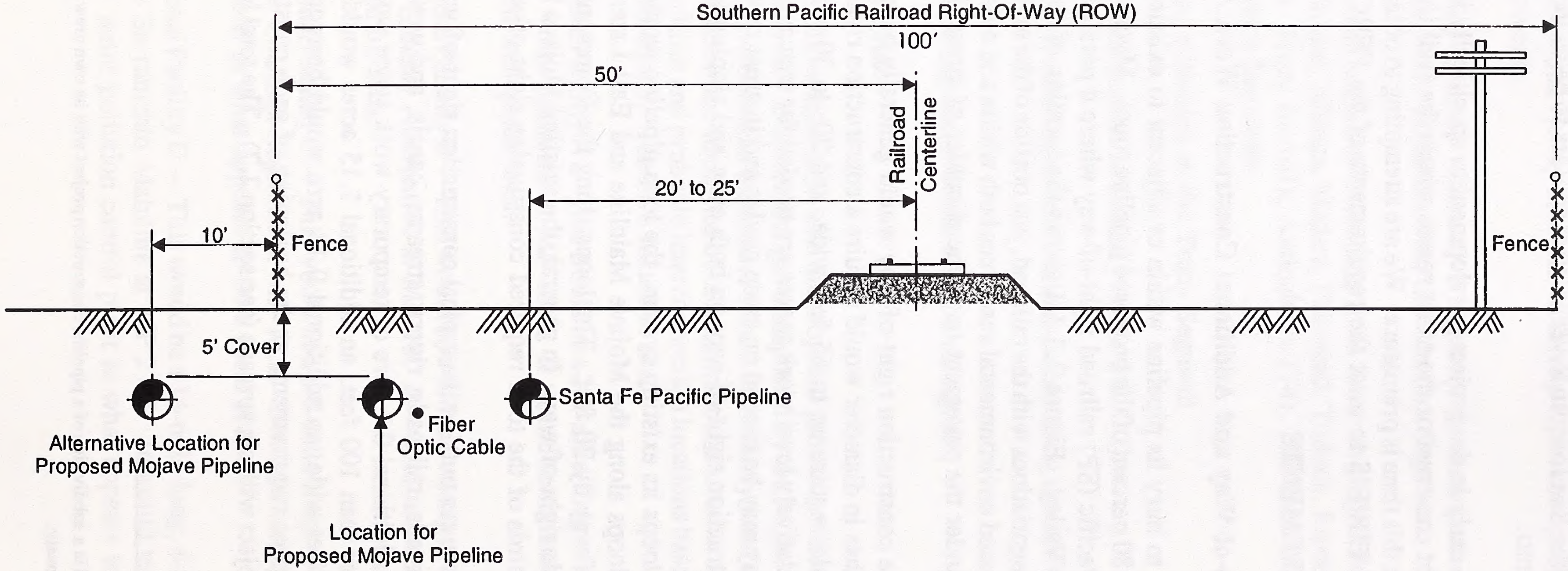
Where Mojave loops its existing system, the loop pipeline would be offset 20 feet from the existing pipeline. The loops along the Mojave Mainline and East Lateral would require extending the 95-foot-wide right-of-way by 20 feet. The loops along the Commonline would be placed within the existing 100-foot-wide right-of-way. In general, the existing Mojave Pipeline right-of-way would be used for up to two-thirds of the total required construction right-of-way for the looped sections.

Additional work areas outside the typical construction right-of-way would be required where the route crosses paved roads, railroads, rivers, streams, canals, and wetlands. At all road, railroad, and canal crossings, an additional 0.1 acre of temporary work space would be required. At stream and river crossings wider than 100 feet, an additional 1.15 acres would be required, and at stream crossings less than 100 feet wide, an additional 0.18 acre would be required. There would also be other temporary work space requirements at the beginning of each construction spread. 1/ Mojave plans to construct the project with six spreads (see section 2.7). The total land requirement for staging

---

1/ A construction spread is a subdivision of a pipeline construction project with its own crew and equipment. Two or more spreads may occur simultaneously.

02: OJ3140\OJ_110.CDR



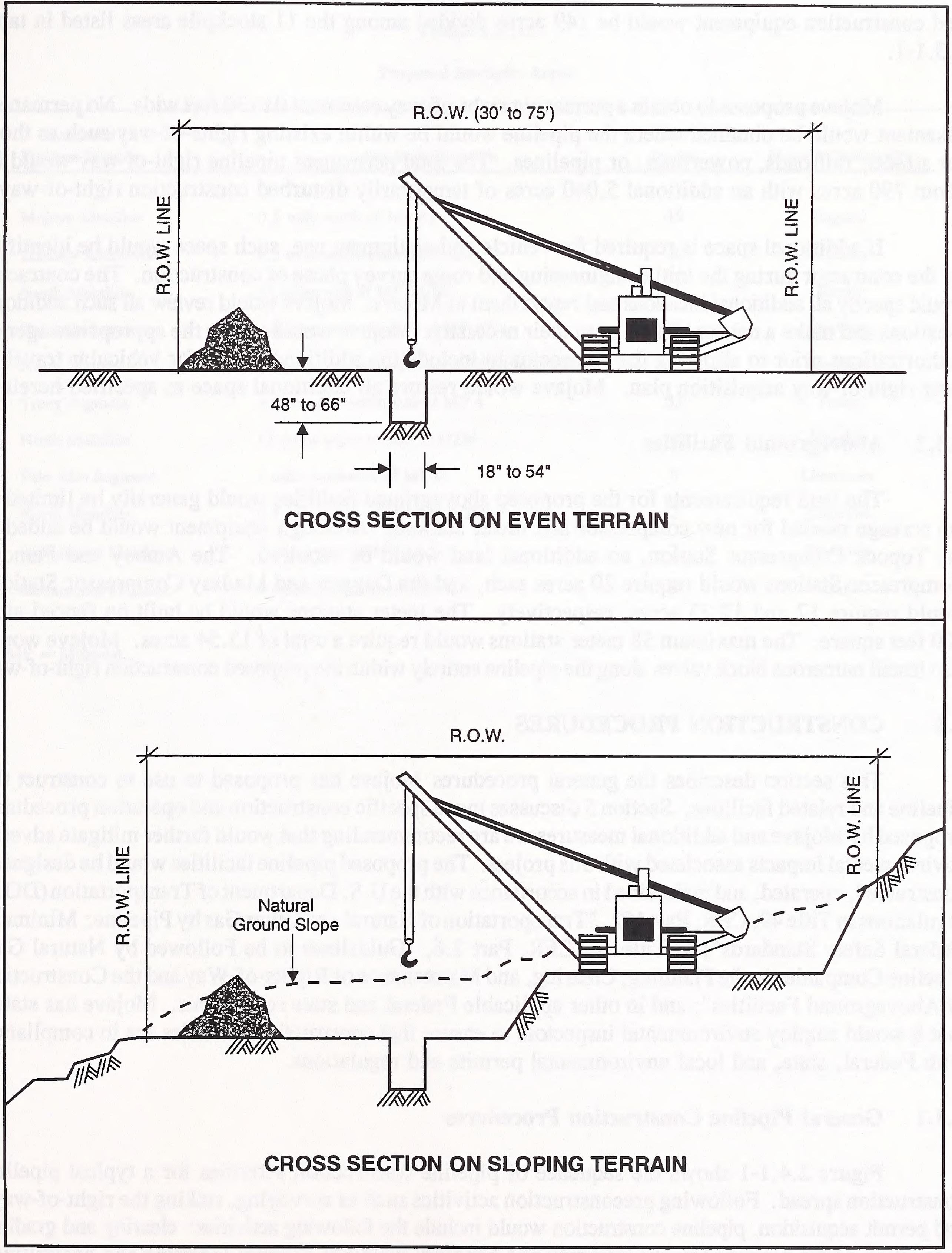
Southern Pacific Railroad Right-Of-Way (ROW)
100'
50'
Railroad Centerline
20' to 25'
10'
Fence
Fence
5' Cover
Santa Fe Pacific Pipeline
Fiber Optic Cable
Alternative Location for Proposed Mojave Pipeline
Location for Proposed Mojave Pipeline

SOURCE: Woodward-Clyde Consultants

© 1994 Ecology and Environment, Inc.

Figure 2.3.1-1 PIPELINE LOCATION ALONG SOUTHERN PACIFIC RAILROAD RIGHT-OF-WAY

02: OJ3140\OJ_113.CDR (PG2)


R.O.W. (30' to 75')
R.O.W. LINE
R.O.W. LINE
48" to 66"
18" to 54"
CROSS SECTION ON EVEN TERRAIN
R.O.W.
R.O.W. LINE
R.O.W. LINE
Natural
Ground Slope
CROSS SECTION ON SLOPING TERRAIN

SOURCE: Woodward-Clyde Consultants

© 1994 Ecology and Environment, Inc.

Figure 2.3.1-2 CROSS SECTIONS OF TYPICAL CONSTRUCTION RIGHTS-OF-WAY ON EVEN AND SLOPING TERRAIN

and construction equipment would be 149 acres divided among the 11 stockpile areas listed in table 2.3.1-1.

Mojave proposes to obtain a permanent right-of-way easement 0 to 30 feet wide. No permanent easement would be obtained where the pipeline would be within existing rights-of-way such as those for streets, railroads, powerlines, or pipelines. The total permanent pipeline right-of-way would be about 790 acres with an additional 5,040 acres of temporarily disturbed construction right-of-way.

If additional space is required for vehicle and equipment use, such space would be identified by the contractor during the initial engineering and route survey phase of construction. The contractor would specify all additional locations and report them to Mojave. Mojave would review all such additional locations and make a determination as to their necessity. Mojave would obtain the appropriate agency authorizations prior to allowing the contractor to include the additional space for vehicular travel in their right-of-way acquisition plan. Mojave would restore all additional space as specified herein.

2.3.2 Aboveground Facilities

The land requirements for the proposed aboveground facilities would generally be limited to the acreage needed for new compressor and meter stations. Although equipment would be added at the Topock Compressor Station, no additional land would be required. The Amboy and Famoso Compressor Stations would require 20 acres each, and the Daggett and Lindsay Compressor Stations would require 17 and 17.23 acres, respectively. The meter stations would be built on fenced sites 100 feet square. The maximum 58 meter stations would require a total of 13.54 acres. Mojave would also install numerous block valves along the pipeline entirely within the proposed construction right-of-way.

2.4 CONSTRUCTION PROCEDURES

This section describes the general procedures Mojave has proposed to use to construct the pipeline and related facilities. Section 5 discusses more specific construction and operation procedures proposed by Mojave and additional measures we are recommending that would further mitigate adverse environmental impacts associated with this project. The proposed pipeline facilities would be designed, constructed, operated, and maintained in accordance with the U.S. Department of Transportation (DOT) regulations in Title 49, CFR, Part 192, "Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards"; in Title 18, CFR, Part 2.6, "Guidelines to be Followed by Natural Gas Pipeline Companies in the Planning, Clearing, and Maintenance of Rights-of-Way and the Construction of Aboveground Facilities"; and in other applicable Federal and state regulations. Mojave has stated that it would employ environmental inspectors to ensure that construction activities are in compliance with Federal, state, and local environmental permits and regulations.

2.4.1 General Pipeline Construction Procedures

Figure 2.4.1-1 shows the sequence of pipeline construction activities for a typical pipeline construction spread. Following preconstruction activities such as surveying, staking the right-of-way, and permit acquisition, pipeline construction would include the following activities: clearing and grading; excavation of the pipeline trench; stringing and bending; welding; coating; lowering and backfilling; testing; replacement of topsoil; cleanup; restoration; and startup. Before construction, Mojave would survey and stake the pipeline centerline and the boundaries of the construction rights-of-way and staging

TABLE 2.3.1-1

Proposed Stockpile Areas

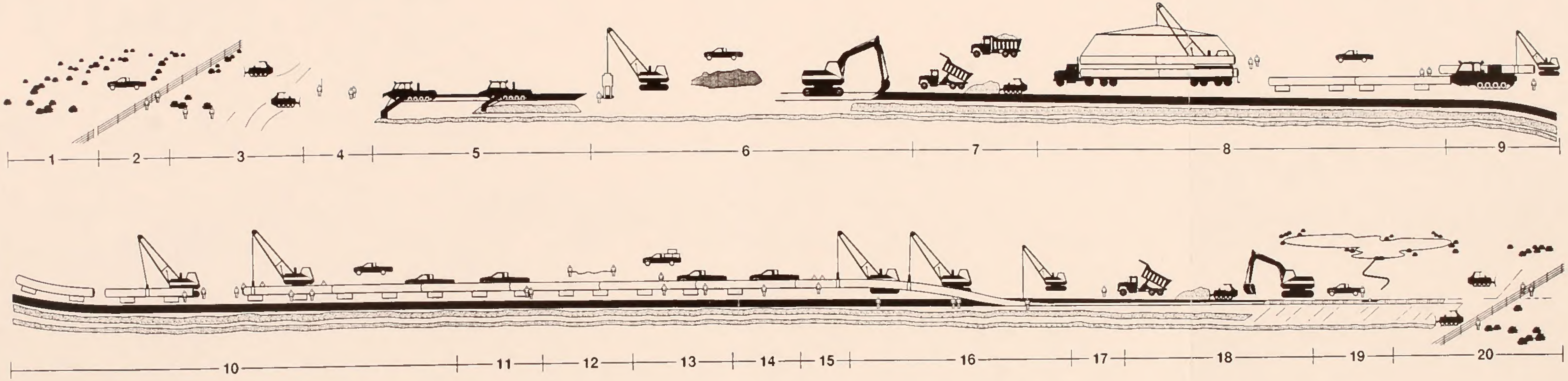
Associated Pipeline Segment	Stockpile Location	Size (acres)	Nearest Community
Mojave Mainline	0.5 mile south of MP 83	19	Bagdad
Lindsay Alternative	0.5 mile northeast of MP 42.6	10	Lindsay
North Mainline	13 miles east of MP 71/80	25	Exeter
Coalinga Segment	Adjacent on north side at MP 47.4	25	Coalinga
North Mainline	Adjacent on northeast side at MP 190.3/198.9	17	Turlock
Tracy Segment	Adjacent on south side at MP 4	33	Tracy
North Mainline	12 miles south of MP 218/226	6	Westley
Palo Alto Segment	1 mile northwest of MP 0	5	Livermore
North Mainline	0.7 mile north of MP 284.7/293.5	2	Concord
Sacramento Mainline	7 miles west of MP 13.5	2	Stockton
Sacramento Mainline	6 miles southwest of MP 43	5	Galt

MP = Milepost.

THIS PAGE INTENTIONALLY BLANK

02: OJ3140\OJ_2411.CDR

PIPELINE CONSTRUCTION SEQUENCE



KEY:

1 Right-of-Way Acquisition and Survey
2 Fencing
3 Clearing and Grading
4 Restaking Centerline of Trench
5 Trenching (Rock-Free)
6 Trenching through Rock
7 Padding Trench Bottom
8 Stringing
9 Bending
10 Line-Up, Stringer Bead and Hot Pass
11 Fill and Cap Welding
12 As-Built Footage
13 X-Raying and Weld Repairing
14 Coating
15 Inspecting (Jeeping) and Repairing Coating
16 Lowering In and Tie-Ins
17 As-Built Survey
18 Padding and Backfilling
19 Testing and Final Tie-In
20 Replacing Topsoil and Cleanup

NOT TO SCALE

© 1994 Ecology and Environment, Inc.

SOURCE: Ecology and Environment, Inc. 1994

Figure 2.4.1-1 TYPICAL PIPELINE CONSTRUCTION SPREAD

areas. The right-of-way stakes would be no farther than 200 feet apart and maintained throughout construction.

Construction of the proposed pipeline would generally follow standard pipeline construction methods. The rights-of-way would be cleared and graded to ensure the safe and efficient operation of construction equipment. The trees on the edges of the right-of-way would be marked and left undamaged. During clearing, any fences crossed by the right-of-way would be braced, cut, temporarily fitted with gates, and controlled as necessary to prevent the escape of livestock during construction. After construction, the fences would be restored with the braces left in place. No gates or cattle guards on established roads over public lands would be obstructed or damaged by construction activities. Topsoil would be stripped from over the trench and subsoil storage area in all cultivated fields, residential areas, areas where extensive grading would occur, and other areas at the landowner's or land manager's specific request. The topsoil and subsoil would be stored in separate windrows on the nonworking side of the right-of-way.

In areas of rugged topography with steep side slopes, Mojave would use cut-and-fill techniques. On sidehill slopes, a level working pad would be cut into the hillside with a bulldozer. Trenches would be excavated with a self-propelled trenching machine wheelditcher, saw trencher, or backhoe. The depth of the trench would vary with the diameter of the pipeline and the various overburden conditions encountered. In all cases, the pipeline burial depth would meet or exceed that required by DOT regulations; for normal soil, this depth would be 30 to 36 inches. Between MP 0 and MP 215.8/224.5 on the North Mainline, i.e., between Bakersfield and the junction with the Sacramento Mainline, the soil cover depth would be 60 inches.

Tractor-mounted mechanical rippers or rock-trenching equipment would be used where rock or rock formations are encountered. Where surface or subsurface rock is unrippable, blasting would be necessary. Precautions would be taken to protect threatened or endangered species (see section 5.6). Care would also be taken to prevent damage to underground structures such as cables, conduits, and pipelines as well as to springs, water wells, and other water sources. Before blasting, the affected area would be checked to ensure that construction personnel, other persons, and all equipment are out of the danger area. Where blasting occurs adjacent to public or private roads, flagmen would be stationed at safe distances to control traffic and protect the public. Matting would be used where necessary to protect surrounding property. After blasting has been completed, backhoes would be used to clean the ditch for pipe installation. All blasting would be conducted during daylight hours and would not begin until owners and occupants of nearby residences, farms, businesses, and other buildings have been notified. In all cases, all applicable Federal, state, and local regulations would be observed, and all necessary permits and authorizations would be obtained including those of the U.S. Bureau of Alcohol, Tobacco and Firearms (27 CFR 55) and the Occupational Safety and Health Administration (OSHA) (29 CFR 1910.109-1926.914).

After trenching, pipe sections would be strung along the edge of the trench, bent to fit the contour of the trench, aligned, welded together, and placed on temporary supports. All welds would be visually and radiographically inspected and repaired if necessary. Line pipe, normally mill- or yard-coated before stringing, would require a coating at the welded joints before final inspection. The entire pipeline coating would be electronically inspected to locate and repair any faults or voids. The pipeline would then be lowered into the trench by side-boom tractors, and the trench would be backfilled using a backfilling machine or bladed equipment. No foreign materials including skids, welding rods, containers, brush, trees, and refuse of any kind would be permitted in the backfill.

After backfilling, the pipeline would be hydrostatically tested in accordance with DOT regulations to ensure that the system is capable of operating at the design pressure. Should a leak or break occur, the line would be repaired and retested until the specifications are met. Test segment lengths would be determined by topography and water availability. Water would be obtained from local water districts near the pipeline sections or would be imported from other areas, if necessary. Where possible, test water would be reused in adjacent sections before being discharged. When all segments are tested, the water would be discharged in accordance with applicable Federal and state regulations concerning water quality.

After hydrostatic testing, the work areas would be graded and restored as near as practicable to the original contours including moving fill material back into sidehill cuts. Where topsoil or subsoil separation has occurred, soils would be backfilled in a sequence and density that would reproduce preconstruction conditions, i.e., subsoils would be replaced first, followed by stockpiled topsoil. Permanent soil stabilization measures would include construction of water bars along contours of disturbed areas and the revegetation of rights-of-way to the satisfaction of the jurisdictional and management agency or landowner. On cultivated or improved lands, measures would be taken to remove rock and debris or otherwise leave the ground surface in a satisfactory condition. If drainage tiles are damaged, they would be restored to their original condition or better. Further details are in the Erosion Control, Revegetation, and Maintenance Plan in appendix A.

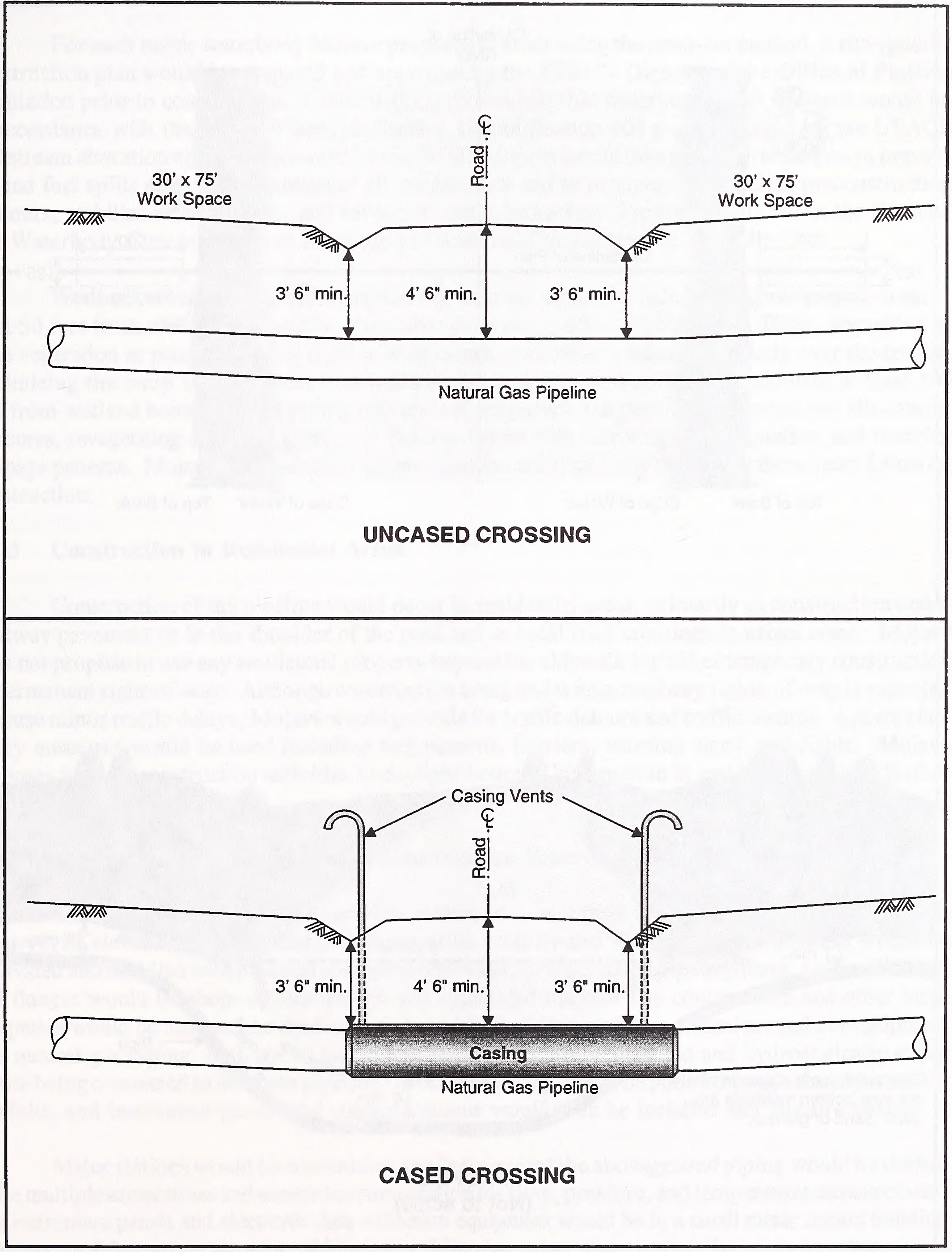
2.4.2 Construction Procedures for Road, Rail, Waterbody, and Wetland Crossings

Major or improved roads and railroads would be crossed by boring to avoid disrupting traffic. Additional temporary work areas, typically 30 by 75 feet, would be required on each side of the crossing to accommodate boring equipment, soil storage, and pipeline fabrication. Unsurfaced, lightly traveled, or rural roads would be crossed by the open-cut method if approved by the owner or road management agency, and an additional temporary staging area 30 by 50 feet would be required on each side of the crossing. Pipeline installation at open-cut crossings including cleanup and restoration of road surfaces would be typically completed in one day. Mojave would make provisions to detour or control traffic during such construction. Figure 2.4.2-1 shows typical road crossings.

Generally, minor water crossings (less than 10 feet wide) and intermediate water crossings (10 to 100 feet wide) would be made by open-cut trenching. The exceptions would be: (1) minor streams containing coldwater or significant warmwater fisheries, which would be crossed using dry-ditch methods that temporarily reroute the water using flume pipe, and (2) lined irrigation canals that would be crossed by boring or spanned overhead on a bridge. Trenching and pipe installation at open cut minor stream crossings would be completed in 24 hours unless blasting is required. Trenching, pipe installation, and backfilling at intermediate stream crossings would be completed in 48 hours unless blasting is required. At all minor and intermediate stream crossings, excavated material would be stockpiled at least 10 feet from the stream banks in temporary 40- by 100-foot staging areas on each side of the stream.

Major streams and rivers (more than 100 feet wide) would be crossed by horizontal directional drilling or open-cut trenching. Figure 2.4.2-2 shows the plan and profile of a typical crossing. Directional drilling would require the drilling of a pilot hole beneath the river channel to the opposite bank. After the pilot hole is reamed and enlarged sufficiently to allow pipeline passage, prefabricated pipe segments would be pulled through the hole to complete the crossing. Temporary 50- by 500-foot staging areas would be required on each side of the crossing. Mojave would locate these work areas at least 50 feet from the stream or river banks to maintain riparian vegetation.

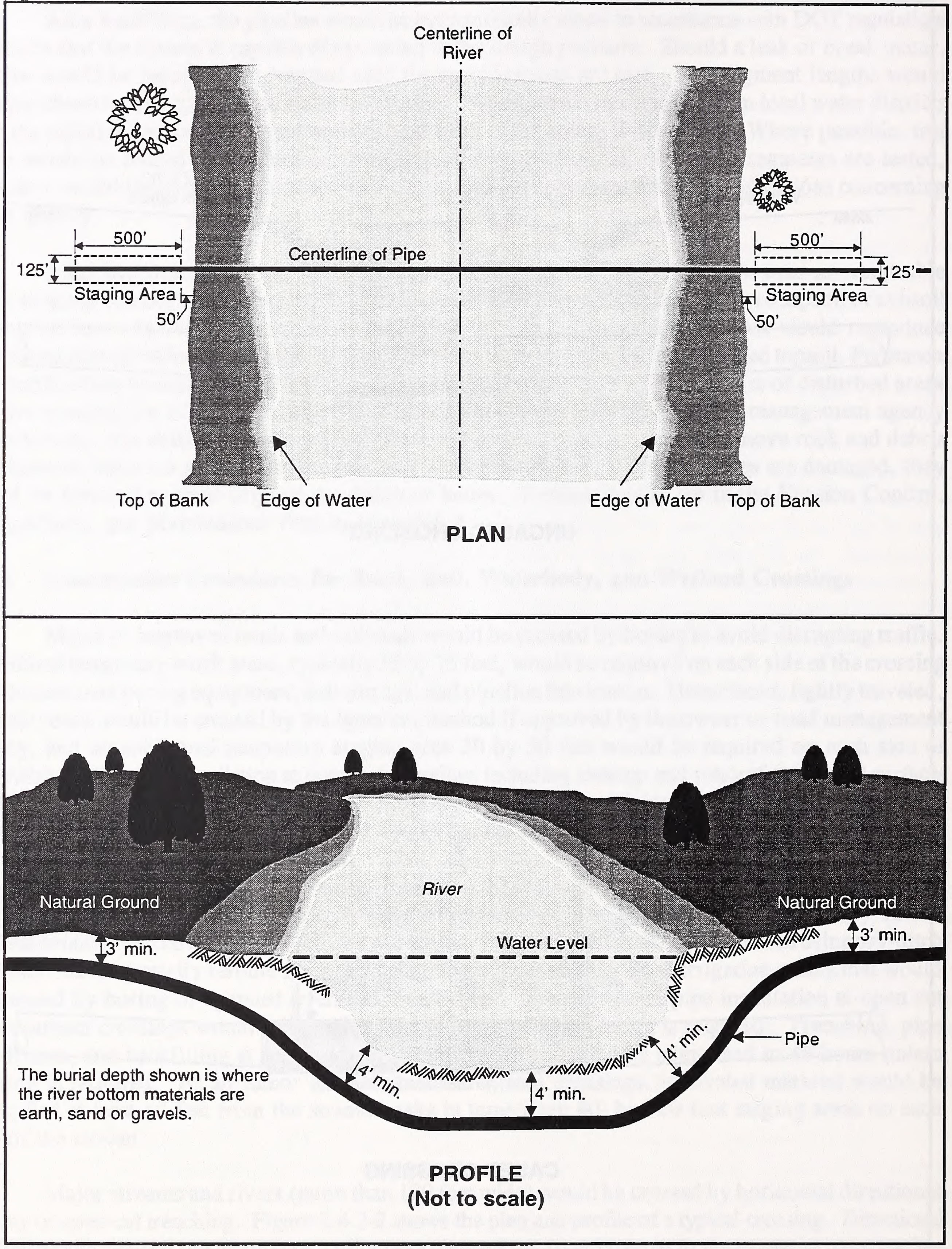
02: OJ3140\OJ_113.CDR (P1)


30' x 75'
Work Space
Road ℄
30' x 75'
Work Space
3' 6" min.
4' 6" min.
3' 6" min.
Natural Gas Pipeline
UNCASED CROSSING
Casing Vents
Road ℄
3' 6" min.
4' 6" min.
3' 6" min.
Casing
Natural Gas Pipeline
CASED CROSSING

SOURCE: Woodward-Clyde Consultants

© 1994 Ecology and Environment, Inc.

Figure 2.4.2-1 CROSS SECTIONS OF TYPICAL ROAD CROSSINGS


Centerline of River
500'
500'
Centerline of Pipe
125'
125'
Staging Area
Staging Area
50'
50'
Top of Bank
Edge of Water
Edge of Water
Top of Bank
PLAN
River
Natural Ground
Natural Ground
3' min.
3' min.
Water Level
4' min.
4' min.
4' min.
Pipe
The burial depth shown is where the river bottom materials are earth, sand or gravels.
PROFILE
(Not to scale)

SOURCE: Woodward-Clyde Consultants

© 1994 Ecology and Environment, Inc.

Figure 2.4.2-2 PLAN AND PROFILE OF TYPICAL MAJOR STREAM OR RIVER CROSSING

For each major waterbody Mojave proposes to cross using the open-cut method, a site-specific construction plan would be prepared and approved by the FERC's Director of the Office of Pipeline Regulation prior to construction. Construction across navigable waterbodies and wetlands would be in accordance with the Clean Water Act Section 10 and Section 404 permits issued by the USACE and stream alteration agreements issued by the DFG. Mojave would take proper precautions to prevent oil and fuel spills and other pollution of all waterbodies and to promptly re-establish preconstruction contours, stabilize stream banks, and revegetate disturbed areas. Further details are in the Wetland and Waterbody Construction and Mitigation Procedures (Procedures) in appendix C.

Wetlands would be crossed using the Procedures, which include locating all staging areas at least 50 feet from wetland boundaries, minimizing the construction right-of-way width, disturbing as little vegetation as possible during right-of-way clearing, limiting grading to directly over the trench, minimizing the entry of equipment into wetlands, storing fuel and refueling equipment at least 100 feet from wetland boundaries, applying appropriate temporary and permanent erosion and silt control measures, revegetating and rehabilitating all disturbed areas with native wetland vegetation, and restoring drainage patterns. Mojave would monitor the revegetation effort annually for at least three years following construction.

2.4.3 Construction in Residential Areas

Construction of the pipeline would occur in residential areas, primarily as construction under roadway pavement or in the shoulder of the road and as local road crossings in urban areas. Mojave does not propose to use any residential property beyond the sidewalk for either temporary construction or permanent right-of-way. Although construction along and within roadway rights-of-way is expected to cause minor traffic delays, Mojave would provide for traffic detours and traffic control. Appropriate safety measures would be used including flag persons, barriers, warning signs, and lights. Mojave proposes to limit construction activities to daylight hours. Construction in residential areas is further discussed in section 5.7.1.2.

2.4.4 Compressor and Meter Station Construction Procedures

Each compressor station site would be cleared of trees, brush, and debris, graded and compacted to surveyed elevations, and fenced for construction security and safety. The foundations would be excavated and installed with pipe and conduit access ways. Prefabricated pipe segments, valves, fittings, and flanges would be shop- or site-welded and assembled onsite. The compressors and other large equipment would be mounted on the foundation, and the building would be erected around the equipment. The natural gas piping, both above and below ground, would be installed and hydrostatically tested before being connected to the main pipeline. Electrical wiring would be pulled through already installed conduits, and instrument panels and control systems would then be installed and circuit-checked.

Meter stations would be constructed similarly except the aboveground piping would be limited to the multiple meter tubes and sensor instrumentation for flow, pressure, and temperature measurement. The instrument panels and electronic data collection equipment would be in a small meter station building. The startup of the meter stations would be in carefully planned sequences to verify proper interconnections and equipment operation.

At all aboveground facilities, Mojave would be required to minimize disturbance to the site by following proper construction procedures and the FERC staff's Erosion Control, Revegetation, and Maintenance Plan (appendix A). Construction activities and material storage would be confined to designated areas, and disturbed surface areas would be restored as soon as practicable following construction. Excess soil would be used onsite or disposed at approved areas offsite, and wastes would be disposed in an approved manner. After startup and testing, compressor and meter station sites would be cleaned, graded, and permanently fenced. Entry roads and parking areas would be paved, and landscaping would be completed as necessary as visual and sound buffers.

2.4.5 Mainline Valve Construction Procedures

Mainline valves would be installed within the permanent right-of-way at intervals stipulated by DOT regulations in locations easily accessible to Mojave personnel. Blow-down valves would be placed 4 feet above the natural ground level. Line valves would be installed below ground and equipped with watertight gear housing extensions for aboveground operation. After valve fabrication, installation, and inspection and site backfilling and cleanup, a 6-foot-high security fence would be erected around each valve installation to protect it from possible damage or tampering.

2.4.6 Access Roads

Mojave does not plan to construct any new temporary or permanent access roads except the short entry roads to the new compressor stations. Existing roads or the proposed rights-of-way would be used for surface travel during construction, operation, and maintenance. Mojave has proposed to upgrade 4.3 miles of two existing unpaved roads in eastern Contra Costa County in accordance with applicable standards and the permitting requirements of all jurisdictional agencies. For these access road improvements, Mojave would be required to obtain permits from appropriate jurisdictional agencies, conform to applicable standards, and design and conduct appropriate surveys to consider grades, soils, compaction, minimum widths, horizontal and vertical curvature, outslope, drainage, and cut-and-fill slopes.

2.5 OPERATION AND MAINTENANCE

The proposed facilities would be operated, maintained, and inspected in accordance with DOT regulations in Title 49, CFR, Part 192, and other applicable Federal and state regulations. Pipeline, compressor station, and meter station operation including gas pressures and flows would be monitored and remotely controlled via Mojave's Supervisory Control and Data Acquisition (SCADA) system, which is manned 24 hours a day by personnel at Mojave's central office in Bakersfield. Mojave's operations department would provide environmental services including maintenance procedures and emergency response plans. Maintenance activities would include the following:

- Mowing and/or selective cutting of woody vegetation in the 10-foot-wide permanent herbaceous rights-of-way through wooded areas, walnut and almond orchards, and areas of heavy brush.
- Mowing where required by city ordinance or local zoning requirements.
- Inspecting the rights-of-way to identify erosion and encroachment problems.
- Repairing eroded areas.
- Inspecting for revegetation success in the early years following construction.

- Controlling off-road vehicle use of the right-of-way in cooperation with landowners.
- Controlling any noxious weed populations resulting from construction of the pipeline using only approved herbicides.

Routine operation and maintenance (O&M) performed by skilled technicians would include the inspection and maintenance of valves, meters, pressure regulators, compressors, emergency shutdown systems, and control equipment. All fence posts, signs, aerial markers, and decals would be repainted or replaced as needed to ensure that the pipeline location is visible from the air and the ground. Aerial inspections would be conducted at least once a month and additionally as needed to survey for evidence of leaks, corrosion, soil erosion, and other safety-related conditions as well as third-party use of the right-of-way, construction by others in the vicinity, the progress of postconstruction environmental restoration, and changes in population density near the pipeline. Vehicular or walking surveys would initially be performed at weekly or biweekly intervals and later extended to monthly intervals. These patrols would be in addition to surveillance provided by employees traveling along the right-of-way for routine O&M activities. To protect wildlife in sensitive areas, postconstruction vehicular access would be restricted to authorized vehicles for emergency maintenance only. Routine inspections in sensitive areas would be by walking surveys. The inspection protocol used for surface surveys would be the same as used for aerial surveys.

During operation, Mojave would be required to maintain the pipeline including using a "smart pig" to inspect the pipeline and a "swab pig" to clean the pipeline with pig launcher and receiver sites located at compressor stations, pipeline endpoints, and specified intermediate locations on each segment. 2/ Mojave would be required to handle and dispose waste products collected during pigging in compliance with all applicable laws and regulations.

The cathodic corrosion protection system would be monitored regularly, and any problems would be corrected promptly and rechecked no later than one year after initial discovery.

Compressor station personnel would calibrate equipment and instruments, inspect critical components, and maintain and clean equipment. Safety equipment at the compressor stations such as fire protection and gas detection systems would be checked periodically. The recording and transmitting of pressure and temperature data would be controlled remotely via the SCADA system in Bakersfield.

Pollution Prevention Program

Mojave has instituted a pollution prevention program that encompasses both pipeline construction and operation. Specific pollution prevention activities that would be implemented include dust suppression, secondary containment of hazardous materials, water and energy conservation, recycling of solid waste, minimizing the generation of hazardous waste, and proper disposal of generated hazardous waste.

2/ "Smart pig" is the common name for an instrumented internal inspection device. A smart pig is a selfpropelled or compressed-air-driven inspection gadget that carries various sensors and data-recording and telemetry equipment. It is used to internally inspect pipelines, e.g., to locate and examine welds, dents, wrinkles, and other deformations and to measure bending strain. A "swab pig" is used to clean pipelines internally.

2.6 SAFETY CONTROLS

Mojave has indicated that the proposed facilities would be tested, operated, and maintained in accordance with Title 49, CFR, Part 192, and other applicable Federal and state regulations. Pipeline rights-of-way would be clearly marked where they cross public roads, railroads, rivers, other navigable waters, fenced property lines, and other sensitive locations. All facilities would be marked and identified in accordance with applicable regulations. All pipelines and compressor and meter station piping would be constructed of carbon steel pipe manufactured in accordance with American Petroleum Institute specifications for high-test line pipe. Nominal wall thicknesses would be based on DOT classifications in accordance with its safety regulations. All pipe would be externally mill- or yard-coated with fusion-bonded epoxy coating. The pipeline would be further protected from corrosion by a cathodic protection system, which would be monitored regularly as described in section 2.4.

Mojave would comply with all applicable DOT codes and American National Standards Institute (ANSI) B-31.4 and B-31.8 requirements along railroad rights-of-way. Mojave has indicated that the pipe thickness or burial depth (5 feet) at specified locations may be increased for additional safety as required by the railroads. Mojave would comply with the railroads' design criteria for pipelines containing flammable substances that cross or parallel their railroads including carrier pipe, casing design, and construction specifications, inspection and testing guidelines, and shutoff valve safety requirements.

Mojave would develop an emergency contingency plan specifically for the Northward Expansion Project to inform local fire and police departments of the necessary procedures in the event of an emergency. The written plan would comply with all Federal and state requirements and would include a classification of events that require emergency response and the response procedures for various types of emergencies including leaks, explosions, fires,and natural disaster. The procedures would include those for communicating and coordinating with authorities and public officials during emergencies as well as emergency shut-down procedures. The plan would also include the names and phone numbers of the Mojave personnel to be contacted in an emergency.

Other safety controls including Mojave's 24-hour Gas Control Center are described in section 5.11.

2.7 CONSTRUCTION SCHEDULE

Project construction would take nine months. The North and Sacramento Mainlines and various segments would be constructed by four spreads: Spreads I, II, and III in uncongested open areas and Spread II-A in congested urban areas. The loops would be constructed by two additional spreads, Spreads IV and V. Separate work crews would construct the three new compressor stations and modify the existing Topock Compressor Station. Construction on all spreads and the compressor stations is scheduled to commence mid 1995, pending FERC certification and SLC approval. Construction would start at the southern end of each spread and move northward.

2.8 PROPOSED MITIGATION

Mojave has indicated that, in general, the impact of the project would be mitigated by adhering to the construction and restoration techniques and mitigation measures that were designed specifically for the project as well as those procedures contained in the Erosion Control, Revegetation, and Maintenance Plan (appendix A) and the Wetland and Waterbody Construction and Mitigation Procedures (appendix C). All of the measures that are part of Mojave's proposal are discussed in the appropriate sections of this draft EIR/EIS and are listed in section 7. We have recommended additional mitigation where necessary to further minimize project-related impact.

The FERC and SLC would ensure compliance with the mitigation measures incorporated in this EIR/EIS through the adoption of an environmental inspection and mitigation monitoring plan for the project.

2.9 FUTURE PLANS AND ABANDONMENT

Mojave has no specific plans for the further expansion of its facilities beyond the proposed project whose economic life is estimated at 30 to 50 years. Mojave would need to obtain authority from the FERC under section 7(b) of the NGA to abandon its facilities. Mojave has indicated that it would seek authority to abandon the pipeline in place. The FERC Order would determine how and when this would occur; however, Mojave has stated that, upon ceasing operation, the underground pipeline would be purged of natural gas in accordance with Title 49, CFR, Section 192.727, by pushing a swab pig through the pipeline with nitrogen and sealing the ends. Being inert, the nitrogen gas would serve as a rust inhibitor and have no impact on groundwater or surface water. The compressor and meter stations would be dismantled, and equipment would be salvaged or reused to the extent possible. The compressor station foundations would be broken up, the refuse would be hauled to approved disposal sites, and the sites would be revegetated and restored in accordance with applicable agency regulations in effect at that time.

3.0 MOJAVE PIPELINE EXPANSION ALTERNATIVES

Although California has been a leader in diversifying its energy sources, stimulating energy conservation strategies, and promoting alternative fuel use, natural gas is a fuel of choice because it is relatively clean burning, available, and competitively priced (CEC, 1994). Given California's air quality problems, natural gas will be increasingly important as a power plant fuel, as feedstock for methanol, and for direct use in vehicles (CEC, 1992-1993). As a result of regulatory and market changes, the gas market in North America is becoming integrated, with national and international competition for the production, transportation and consumption of natural gas.

Mojave has proposed a core project including pipeline and aboveground facilities that would transport natural gas to specific customers in Central and Northern California. Mojave also plans to serve one of two alternative groups of additional customers, which would require constructing additional pipeline segments and compressor and meter stations. Figure 3.0-1 depicts the possible final project designs as combinations of the core project plus a looping option plus one or the other set of additional facilities to serve an additional customer group. The specific facilities associated with each alternative were described in section 2.2. Because the project is market driven and the exact customers with which Mojave would successfully negotiate service are not yet known, we evaluated all of the facilities that would be constructed under all of the alternative designs even though only those facilities associated with one design alternative would actually be built.

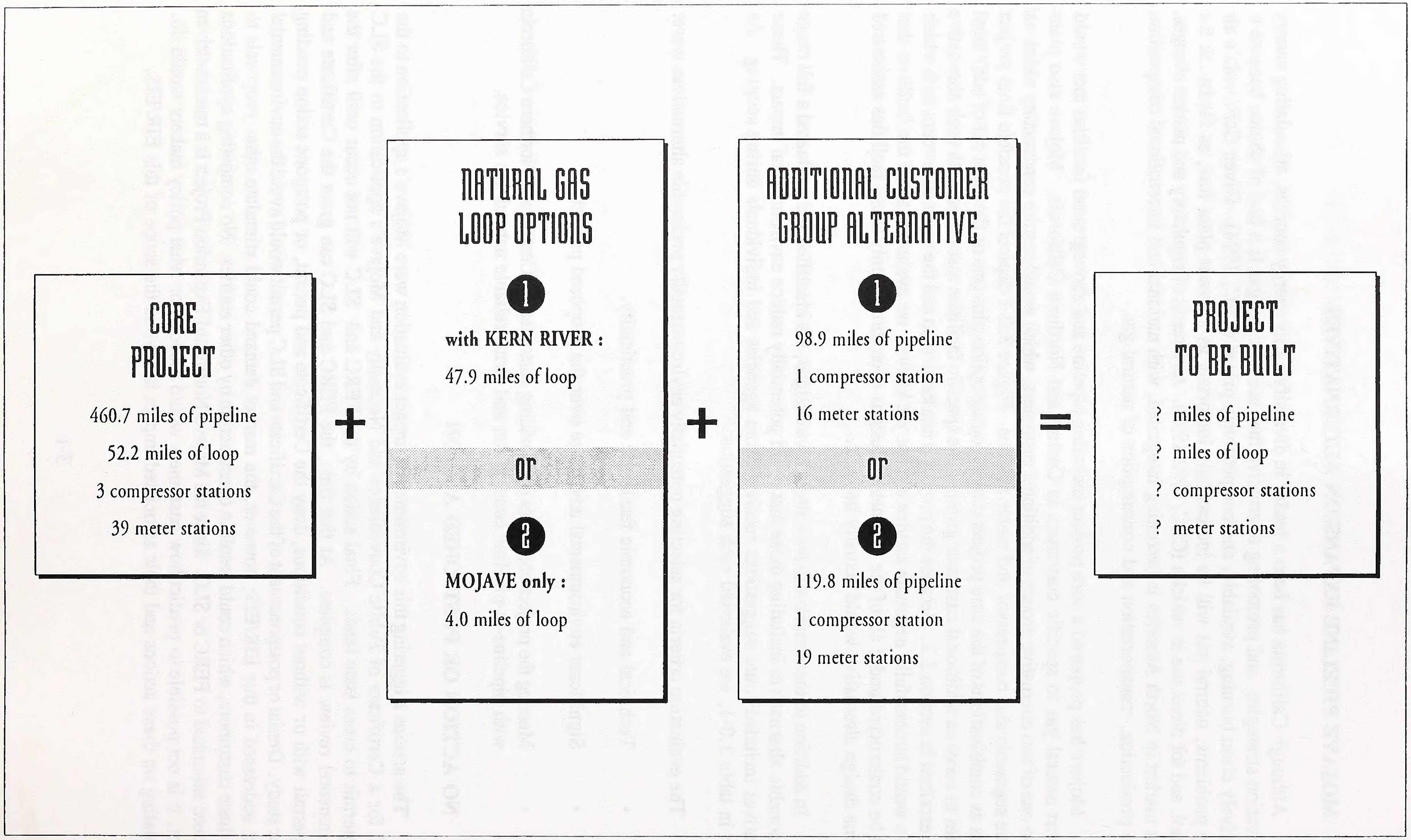
In addition to these market-driven alternative designs, we identified and evaluated a full range of reasonable alternatives including those that could potentially reduce environmental impact. These alternatives included route suggestions received from agencies and individuals during scoping. As shown in table 3.0-1, we evaluated each suggestion.

The evaluation criteria for selecting potentially environmentally preferable alternatives were:

- Technical and economic feasibility and practicality.
- Significant environmental advantage over the proposed project.
- Meeting the project objectives of providing customers in Central and Northern California with pipeline-to-pipeline competition and firm, reliable natural gas service.

3.1 NO ACTION OR POSTPONED ACTION

The actions triggering this environmental impact evaluation were Mojave's application to the FERC for a Certificate of Public Convenience and Necessity and Mojave's application to the SLC for a permit to cross state lands. Final action by the FERC and SLC will not occur until after the environmental review is complete. At that time, the FERC and SLC can grant the Certificate and SLC permit with or without conditions, deny the Certificate and permit, or postpone action pending further study. Denial or postponement of the Certificate and SLC permit would avoid the environmental impact addressed in this EIR/EIS; however, the market demand could stimulate other proposals to serve these customers, which could result in construction by other entities. No competing applications have been submitted to FERC or SLC. Since the Mojave Northward Expansion Project is a market-driven project, it is not possible to predict how customers would respond or what policy makers would do. Speculating on these actions and their associated impact is beyond the scope of this EIR/EIS.


CORE PROJECT
460.7 miles of pipeline
52.2 miles of loop
3 compressor stations
39 meter stations
+
NATURAL GAS LOOP OPTIONS
1
with KERN RIVER :
47.9 miles of loop
or
2
MOJAVE only :
4.0 miles of loop
+
ADDITIONAL CUSTOMER GROUP ALTERNATIVE
1
98.9 miles of pipeline
1 compressor station
16 meter stations
or
2
119.8 miles of pipeline
1 compressor station
19 meter stations
=
PROJECT TO BE BUILT
? miles of pipeline
? miles of loop
? compressor stations
? meter stations

©1994 ecology and environment, inc.

OJ3908.a (c46) 12/28/94

Figure 3.0-1

PROJECT DESIGN ALTERNATIVES

TABLE 3.0-1

Alternative Route Suggestions Received During Public Scoping

Commentor and Date	Alternative Route Suggestion	Response
H. Thomas Beck, 4/21/94	Public right-of-way along Mohler Road near Ripon to avoid disrupting farming activities	Proposed route is parallel and adjacent to Mohler, West Ripon, and Highland Roads consistent with Mr. Beck's suggestion and intent.
Linder Equipment, 5/10/94	Alternatives at southwest Tulare city limits on east sides of I street and railroad	Proposed route is within the railroad ROW parallel to and east side of I Street. It would avoid the Linder property including its frontage on the west side of I Street.
Merced County Planning Department, 5/12/94	An alternative on the west side of the San Joaquin Valley adjacent to existing gas and oil pipelines	Addressed in the I-5, San Joaquin Valley Pipeline, and Pacific Gas and Electric Company alternatives (section 3.3.2).
Zumbach Ranch, 5/15/94	Railroad right-of-way alternatives	Addressed in the Livermore-Oakland Railroad ROW Westward Alternative Route (section 3.3.3.2).
Tri-Valley Associates, 5/17/94	Greenville Road or railroad rights-of-way in Livermore	Addressed in the Tri-Valley/Greenville Road Route Variation (section 3.4) and the Livermore-Oakland Railroad ROW Westward Alternative Route (section 3.3.3.2).
John and Judith McKissack, 5/17/94	Reroute along south and east sides of their property or follow railroad ROWs in Livermore area	Proposed route parallels the southern boundary of their property. Addressed in Livermore-Oakland Railroad ROW Westward Alternative Route (section 3.3.3.2).
City of Livermore, 5/18/94	Other utility/power corridors in the area to reduce impact on agricultural land and operations	Proposed route is closely aligned with existing utility corridor.
Wente Brothers, 5/19/94	Alternatives in South Livermore Valley	Addressed in Livermore-Oakland Railroad ROW Westward Alternative Route (section 3.3.3.2). The route has been modified to parallel the powerline corridor.
City of Fremont, 5/19/94	Routing concerns at the SP tracks near Paseo Padre Parkway, Auto Mall Parkway at I-880 (proposed using existing utility corridor instead of street ROW), east side of I-880 at Fremont Blvd., and Mission Blvd. at I-880	Addressed in Fremont/Southside Railroad Route Variation and Fremont/Automall Parkway Route Variation (section 3.4).
Livermore Area Recreation and Park District, 5/20/94	Alternatives to avoid the Brushy Creek/Vasco Caves area and Mission Peak Ridge Regional Preserve	Avoidance of Brushy Peak areas addressed by Southern Pacific Railroad, San Joaquin Valley Pipeline, and/or Interstate 680 Corridor Northward Alternative Routes (section 3.3.3.1). Avoidance of Mission Peak area addressed by Livermore-Oakland and I-680 Southward alternatives. The proposed route has been modified in response to concerns in the Los Vaqueros/Brushy Peak and Mission Peak areas.
Santa Clara County Parks and Recreation Department, 5/17/94	Alternative across Diablo Mountain Range along active or abandoned railroad or highway corridors	Addressed in Livermore-Oakland Railroad Westward Alternative Route and I-680 Corridor Southward Alternative Route (section 3.3.3.1).
Contra Costa Water District (CCWD), 5/24/94	Various alternatives including relocated Vasco Road and direct route from Tracy to Antioch to reduce impact on Kellogg Creek watershed	Addressed by modifications to the proposed pipeline route through the Kellogg Creek watershed. Direct route addressed by Southern Pacific Railroad alternative (section 3.3.3.1).

TABLE 3.0-1 (chanted)

Commentor and Date	Alternative Route Suggestion	Response
Bold, Polisner, Maddow, Nelson & Judson representing CCWD, 5/19/94	Relocated Vasco Road	Addressed by modifications to the proposed pipeline route through the Kellogg Creek watershed.
City of Pleasanton, 5/18/94	Various alternatives to minimize local land use conflicts	Addressed by Northeast Pleasanton Route Variation and Pleasanton Ridge/Route Variation (section 3.4).
Cowell Ranch, 5/19/94	Routing concerns; alternatives that would avoid planned development.	The proposed pipeline route crosses areas designated for open space, rural residential, and golf course uses, avoiding designated high-, medium-, and low-density residential areas of the proposed Cowell Ranch. Southern Pacific Railroad, San Joaquin Valley Pipeline, and Interstate 680 Corridor Northward Alternative Route avoid Cowell Ranch also.
T. Lindenmeyer, 5/19/94	Alternatives to disturbing sensitive resources in Brushy Peak/Byron Hills area and Mission Peak Ridge Regional Preserve	Avoidance of Brushy Peak area addressed by Southern Pacific Railroad, San Joaquin Valley Pipeline, and/or Interstate 680 Corridor Northward Alternative Routes (section 3.3.3.1). Avoidance of Mission Peak area addressed by the Livermore-Oakland Railroad and I-680 Corridor Southward alternatives (section 3.3.3.2). The proposed pipeline route has been modified in response to concerns in the Los Vaqueros/Brushy Peak and Mission Peak areas.
PG&E, 5/19/94	Evaluate maintenance and expansion of PG&E's existing system as the primary alternative to Mojave	Addressed in section 3.2 (system alternatives).

About half of Mojave's potential customers are served by PG&E, which is regulated by the CPUC. The other potential customers are new entities or customers currently without natural gas service. If the FERC and SLC deny or postpone action, existing PG&E customers would either continue obtaining natural gas from PG&E or use alternative sources of energy, most likely oil on the basis of current economics. Under the current regulatory regime, PG&E customers seeking competitive service from Mojave could not do so, nor could those seeking service from Mojave to ensure a reliable supply of natural gas as a substitute for oil do so. They would need to maintain the capability to store and burn both fuels. Similarly, new customers would have to obtain service from PG&E or Southern California Gas Company (SoCal Gas) in its service area or switch to an alternative fuel. Consequently, the no action and postponed action alternatives would not meet the project objectives of providing pipeline-to-pipeline competition and firm, reliable service.

3.2 SYSTEM ALTERNATIVES

System alternatives are those that use other pipeline systems to achieve the objectives of the proposed project. In this case, the system alternatives are systems transporting natural gas within California. The use of a system alternative would preclude the construction of the proposed project. Alternative systems for transporting natural gas to California were evaluated in detail in the EIR/EIS for the existing Mojave Mainline (SLC and FERC, 1987). Several of the pipelines analyzed as alternatives in that document have been built. Since the Mojave Mainline was completed, FERC Order 636 has been implemented to deregulate some aspects of the natural gas transportation business so that natural gas consumers in California can choose to purchase natural gas from Canadian, Rocky Mountain, or Southwestern producers using a variety of pipelines into the state. As a result, choices regarding both natural gas supplies and pipelines to transport it into the state are now made by consumers largely on the basis of market conditions, in some cases on a daily basis.

Within California, pipeline-to-pipeline competition exists only in Southern California between Mojave, Kern River, PG&E, and SoCal Gas. In Southern California, SoCal Gas serves customers in a small area that Mojave proposes to serve. Although SoCal Gas is a viable system alternative for a few of the customers Mojave proposes to serve because of the location of the SoCal Gas facilities, it would not meet the project's overall objectives. PG&E's existing system is the only system alternative for transporting natural gas in Central and Northern California. PG&E has provided an illustrative case describing improvements and modifications that it would need to make to serve the same customer base Mojave proposes to serve whether or not the Mojave Northward Expansion Project is constructed. PG&E has stated that, if Mojave does not expand, it would need to construct about 55 miles of 36-inch-diameter pipeline (backbone transmission) and about 80 miles of smaller-diameter pipeline (local transmission) and install about 27,000 hp of additional compression at one new and three existing compressor stations in order to serve the same customers. Fewer modifications would be needed if Mojave were to expand.

While the use of PG&E's system including these modifications would result in less overall construction and therefore less environmental impact, it would not meet the project objective of pipeline-to-pipeline competition. Further, PG&E is regulated by the CPUC, which has established a hierarchy of service that requires PG&E to interrupt service to certain customers under specified conditions. Considering the evaluation criteria, neither SoCal Gas nor PG&E would meet the project objectives of providing pipeline-to-pipeline competition in Northern and Central California and providing firm, reliable service. Neither has submitted an application to upgrade or expand facilities to serve the same customer base as Mojave. The SoCal Gas and PG&E system alternatives were, therefore, not considered for further analysis. Other system alternatives that might develop in response to market conditions were considered too speculative for analysis.

3.3 MAJOR ALTERNATIVE ROUTES

A full range of major geographic alternatives were evaluated for those elements of the proposed project where a significant environmental benefit could be foreseen.

3.3.1 Mojave Desert

In the Mojave Desert, alternatives are constrained by the sensitive desert terrain and the large number of recreational or other special use areas in the vicinity, especially in light of the recently passed California Desert Protection Act. The proposed loops would use existing right-of-way exclusively, except in a few areas where it would extend beyond the existing right-of-way. Alternatives to the route in this area were considered in the Mojave-Kern River-El Dorado Natural Gas Pipeline Projects EIR/EIS, incorporated by reference herein. Alternatives included the El Dorado and Kern River pipeline proposals. The Mojave route was found to be environmentally acceptable and was constructed. The main impact of pipeline construction would be the redisturbance of the area previously affected by the construction of the original project, which would extend the restoration period for about 5 more years. Building the pipeline in a different location would not reduce environmental impact. The mitigation proposed would reduce the impact of the new pipeline construction to an acceptable level. No other reasonable alternatives were identified, and Mojave's proposed route is the environmentally preferable alternative.

3.3.2 Central Valley

Initially, a full range of alternative pipeline routes through the Central Valley were evaluated. The San Joaquin Valley, which stretches for 260 miles from the Tehachapi Mountains to the Sacramento River Delta with an average width of 50 miles, is confined by the Sierra Nevada (to 14,492 feet) and the Coast Ranges (to 5,480 feet). Because of its topography and existing agricultural practices, two broad geographic alternatives exist. A pipeline could be routed either on the west side of the valley roughly paralleling Interstate Highway 5 (I-5) or on the east side along State Highway 99 and the SP railroad. A review of highway, electric utility, and pipeline maps showed that no significant existing right-of-way exists through the center of the valley, probably because it would cross diagonally, and therefore significantly interfere with, the operations of some of the most productive agricultural land in the state.

The broad alternative routes that we considered for the Central Valley are listed in table 3.3.2-1 and shown in figure 3.3.2-1. They are: the I-5 Corridor, which includes both the San Joaquin Valley Pipeline and PG&E pipeline routes through the Central Valley; the Cross Valley route, which is the most direct route possible from Tulare to Tracy; the route of the Atkinson, Topeka and Santa Fe (AT&SF) Railroad east of the proposed route; and a route that bypasses Fresno as an example of route variations around urban areas. Because both the SJVP and the PG&E pipeline were analyzed in EIR/EISs that were certified, we evaluated both routes on a broad level to determine whether their use would reduce environmental effects while still meeting the project objectives (SLC and BLM, 1987; CPUC, 1990).

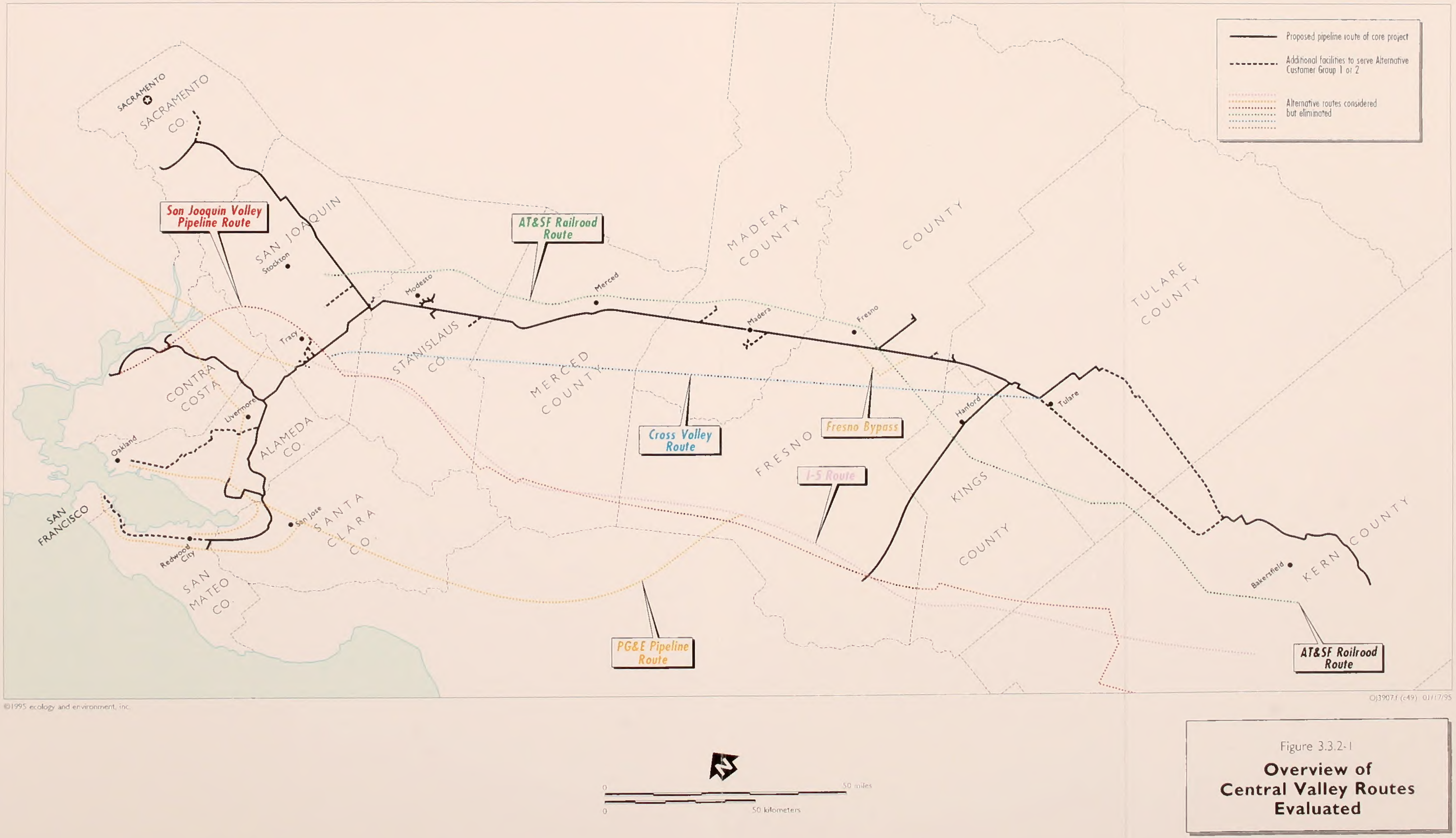
The SJVP route was developed to provide a direct route between specific oil suppliers in the Bakersfield area and the Shell refinery in Martinez. Alternative pipeline routes through the Central Valley were evaluated in the EIR/EIS for the proposed SJVP, and those evaluations are incorporated

TABLE 3.3.2-1

Central Valley Alternative Routes Considered But Eliminated

Alternate Routes	Location	Additional Miles of Pipeline Construction Required	Overriding Considerations
I-5 Corridor (includes PG&E Pipeline and SJVP routes)	McKittrick to Martinez; route combines portions of PG&E pipeline to San Jose and SJVP to Martinez; both parallel I-5	172	• Both PG&E and SJVP pipelines were analyzed in EIR/EISs and found environmentally acceptable; however, the proposed route also uses an existing railroad right-of-way. Both routes encounter areas of potential sensitive species, revegetation constraints, and geologic hazards. • Mojave's potential customers are primarily on the east side of the valley and would require numerous connecting lateral segments. Since significantly more pipeline construction would be required, the environmental impact would be greater than that of the proposed route. • SJVP route from Tracy to Martinez is a viable alternative as discussed in section 3.3.3.
Cross Valley Route	Tulare to Tracy	74	Although this is the most direct route possible, no existing rights-of-way are available for large portions of the route, and the route would bisect large agricultural tracts. Greater distance from potential markets requires construction of more lateral pipelines.
AT&SF Railroad Route	Bakersfield to east of Ripon	18	This route would increase construction through orchards, vineyards,and other agricultural lands. Greater distances from potential customers would require construction of more lateral pipelines.
Fresno Bypass	South of Fresno along North Avenue, then Marks Avenue	12	This route typifies replacing city construction along a railroad right-of-way with suburban/rural construction along roads. Although there are tradeoffs in impact, more pipeline construction would be required. Where customers are within the city, deviating around the city reduces but does not eliminate in-city construction since laterals between the mainline and the customers would still be required.

THIS PAGE INTENTIONALLY BLANK


Proposed pipeline route of core project
Additional facilities to serve Alternative Customer Group 1 or 2
Alternative routes considered but eliminated
SACRAMENTO
SACRAMENTO CO.
San Joaquin Valley Pipeline Route
SAN JOAQUIN
Stockton
AT&SF Railroad Route
Modesto
Merced
MADERA COUNTY
COUNTY
Madera
Fresno
TULARE COUNTY
Tracy
STANISLAUS CO.
MERCED COUNTY
CONTRA COSTA
Livermore
ALAMEDA CO.
Oakland
Cross Valley Route
Fresno Bypass
Hanford
Tulare
FRESNO
I-5 Route
KINGS COUNTY
SAN FRANCISCO
Redwood City
San Jose
SANTA CLARA CO.
SAN MATEO CO.
PG&E Pipeline Route
Bakersfield
KERN COUNTY
AT&SF Railrood Route
N
0
50 miles
0
50 kilometers

©1995 ecology and environment, inc.

OJ3907.f (c49) 07/17/95

Figure 3.3.2-1

Overview of Central Valley Routes Evaluated

here by reference (SLC and BLM, 1987). The alternatives included: a route east of and adjacent to I-5; a route west of and adjacent to I-5; a route paralleling the existing Texaco pipeline; and a route paralleling Lost Hills Road. All were eliminated from further consideration because the impact of the pipeline on resources along all of the routes would have been as great as or greater than the impact of the pipeline on resources along the proposed route.

The environmental effects of PG&E's recent expansion project, which involved construction of pipeline loops adjacent to the Stanpac No. 2 Pipeline for approximately 120 miles from Contra Costa County to Fresno County, were also addressed in an EIR and an EIS (CPUC, 1990; FERC, 1991). No alternative routes were considered south of Alameda County in either document. PG&E's expansion project used right-of-way of an existing PG&E pipeline, which was originally designed to optimize gas deliveries to PG&E's markets.

We also analyzed three other reasonable alternatives in the Central Valley. Use of the Cross Valley or AT&SF route would have greater adverse impact on agricultural lands than Mojave's proposed route. An evaluation of the Fresno bypass shows that, while urban construction would be reduced and suburban/rural construction increased, the effects on environmental resources would be essentially similar. The use of routes within the I-5 corridor would affect the same types of sensitive resources as the proposed route but generally to a greater degree. Each of these routes would require more miles of pipeline construction than the proposed route, and, if the environmental resources affected are comparable, the number of miles of pipeline construction is the single most important indicator of overall environmental impact.

Any pipeline route through the Central Valley is constrained by the intensive agricultural land use and operational practices and by the location of existing urban development. Avoiding the vineyards and orchards in the Central Valley by using existing north-south corridors reduces potentially significant effects. Because of the location of Mojave's potential customers, the use of existing railroad and surface road rights-of-way for about 80 percent of the route, Mojave's commitment to avoid sensitive environmental resources through minor route deviations, and the greater amount of construction that would be required by the alternatives, none was considered environmentally preferable to the proposed route.

3.3.3 Coast Ranges - San Francisco Bay Area

In the San Francisco Bay Area, about 65 percent of the proposed route would use existing rights-of-way to reduce environmental impact; however, during scoping, concerns were raised about the effects of the proposed pipeline on certain sensitive resources, particularly in the Brushy Peak/Vasco Caves area and the Kellogg Creek watershed where the Los Vaqueros Reservoir and associated facilities will be developed. The Los Vaqueros Project is a water resources management project that includes construction of a water storage reservoir in the Kellogg Creek watershed in eastern Contra Costa County and various water conveyance pipelines. The project necessarily includes the relocation of part of Vasco Road, three natural gas pipelines, two oil pipelines, and potentially three electric transmission lines from the 1,400 acres to be inundated. The CCWD is buying 18,600 acres surrounding the reservoir to provide habitat for sensitive species and other wildlife. The proposed route is within a corridor identified for relocating the existing utilities that will be affected by the reservoir. Use of this corridor would avoid significant urban areas, reducing impact on the human environment. Nevertheless, alternatives that would potentially reduce effects on other sensitive resources were also evaluated.

The Los Vaqueros Project EIR/EIS addressed alternative corridors for relocating Vasco Road, the pipelines, and the electric transmission lines (CCWD, 1993). Corridors were selected for analysis on the basis of environmental, cost, and engineering factors to avoid both the Los Vaqueros and Kellogg Reservoirs; the final utility alignment would be selected on the basis of avoiding sensitive resources wherever practicable and providing mitigation where avoidance is not possible. Although the EIR/EIS did not consider specific alignments for pipelines, it concluded "given the similarity of terrain and habitat types, and the extensive surveys conducted by CCWD throughout the project vicinity (covering over 30,000 acres), CCWD does not believe that impact other than those identified in the draft EIR would occur in those minor areas of the proposed corridors that have not been surveyed" (CCWD, 1993, p. 3-13). The CCWD maintains that there is not room in the utility relocation corridor for an additional pipeline; however, the EIR/EIS identified a corridor ranging from 0.5 to 1.0 mile wide with 50 feet between pipelines and a total 150-foot-wide right-of-way for each pipeline. We believe that the corridor can accommodate an additional pipeline and that the use of this right-of-way by an additional pipeline is a legal, not an environmental, issue.

In the Brushy Peak area about 7 miles northeast of Livermore, the East Bay Regional Park District (EBRPD) and the Livermore Area Recreation and Park District (LARPD) have recently acquired land that will be developed for recreational uses in addition to preserving sensitive geologic and other resources. These agencies expressed concerns that pipeline construction near this area would increase the possibility of unauthorized access to and destruction of the sensitive resources before they are able to develop the restrictions under which public access to the areas can occur. As shown in table 3.0-1, several additional alternatives in the San Francisco Bay Area were recommended during scoping.

To address these concerns, we identified and evaluated five alternatives to Mojave's proposed route through the Bay Area in order to determine whether environmentally preferable routes could be developed. As shown in figure 3.3.3-1, three of the five alternative routes evaluated proceed northward, and two course southward. The northward alternative routes are:

- The SP railroad right-of-way between Tracy and Antioch.
- The SJVP route between Tracy and Contra Loma Regional Park.
- The I-680 corridor from Pleasanton north to Martinez.

The southward alternative routes are:

- Existing or abandoned railroad rights-of-way such as the Iron Horse Trail between Livermore and Oakland.
- The I-680 corridor from Pleasanton south to Fremont.

3.3.3.1 Northward Alternative Routes

In order to avoid the Kellogg Creek watershed and the Brushy Peak area but still be able to deliver gas to customers along the proposed route, we first identified potential north-south corridors in Alameda and Contra Costa Counties that would start and end at roughly the same points: the SP railroad right-of-way from Tracy north to Antioch, which is east of the proposed route; the SJVP route from just west of Tracy to Martinez, which is also east of the proposed route; and the I-680 corridor from Pleasanton north to Martinez, which is west of the proposed route. Because of the steep terrain,

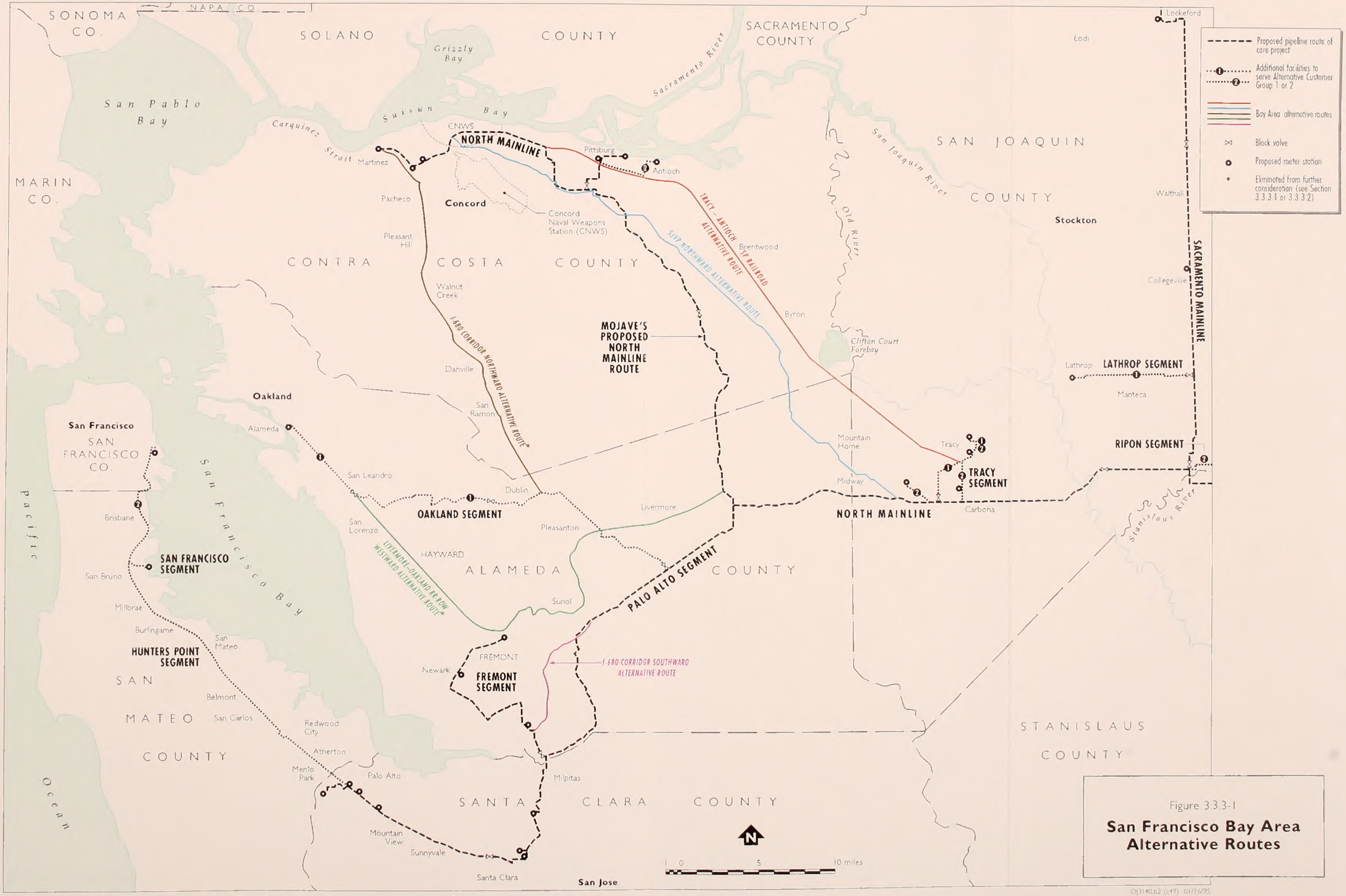

SONOMA CO.
NAPA CO.
SOLANO COUNTY
SACRAMENTO COUNTY
Grizzly Bay
Sacramento River
Lockeford
Lodi
San Pablo Bay
Carquinez Strait
Suisun Bay
CNWS
NORTH MAINLINE
Pittsburg
Antioch
Martinez
Pacheco
Concord
Concord Naval Weapons Station (CNWS)
MARIN CO.
San Joaquin River
SAN JOAQUIN COUNTY
Walthall
Stockton
Pleasant Hill
CONTRA COSTA COUNTY
Brentwood
TRACY – ANTIOCH SP RAILROAD ALTERNATIVE ROUTE
SJVP NORTHWARD ALTERNATIVE ROUTE
Old River
Collegeville
SACRAMENTO MAINLINE
Walnut Creek
I-680 CORRIDOR NORTHWARD ALTERNATIVE ROUTE*
MOJAVE'S PROPOSED NORTH MAINLINE ROUTE
Byron
Clifton Court Forebay
Danville
Lathrop
LATHROP SEGMENT
Manteca
Oakland
San Ramon
San Francisco
Alameda
SAN FRANCISCO CO.
Mountain Home
Tracy
RIPON SEGMENT
TRACY SEGMENT
San Leandro
Dublin
Midway
Carbona
OAKLAND SEGMENT
Livermore
NORTH MAINLINE
Pacific Ocean
Brisbane
San Lorenzo
Pleasanton
Stanislaus River
San Francisco Bay
SAN FRANCISCO SEGMENT
HAYWARD
ALAMEDA COUNTY
LIVERMORE–OAKLAND RR ROW WESTWARD ALTERNATIVE ROUTE*
PALO ALTO SEGMENT
San Bruno
Millbrae
Sunol
Burlingame
San Mateo
FREMONT
I-680 CORRIDOR SOUTHWARD ALTERNATIVE ROUTE
HUNTERS POINT SEGMENT
Newark
FREMONT SEGMENT
SAN MATEO COUNTY
Belmont
San Carlos
Redwood City
STANISLAUS COUNTY
Atherton
Menlo Park
Palo Alto
Milpitas
SANTA CLARA COUNTY
N
Mountain View
Sunnyvale
0
5
10 miles
Santa Clara
San Jose
Proposed pipeline route of core project
Additional facilities to serve Alternative Customer Group 1 or 2
Bay Area alternative routes
Block valve
Proposed meter station
Eliminated from further consideration (see Section 3.3.3.1 or 3.3.3.2)

Figure 3.3.3-1

San Francisco Bay Area Alternative Routes

©1995 ecology and environment, inc.

no corridors between the proposed route and I-680 were considered feasible. Similarly, corridors east of the SP railroad right-of-way would be significantly longer and were, therefore, not considered.

We then determined how the pipeline would most likely be routed through each of these three corridors. Each alternative route's length was calculated from the point at which it would deviate from the proposed route to a common endpoint, the Concord Naval Weapons Station (CNWS). Table 3.3.3.1-1 shows the components of each alternative route and the comparable portions of the proposed route. Because the I-680 alternative route would transport natural gas from west to east, it would need to be extended 3.5 miles to serve customers in Antioch, which the proposed route and other two alternative routes would serve on the way from east to west to the CNWS. The three northward route alternatives are described below.

Tracy to Antioch Southern Pacific Railroad Alternative Route

This route from Tracy to Antioch would begin on the Tracy Segment at MP 3.3 if Alternative Customer Group 1 were served in addition to the Core Customer Group; it would begin at MP 2.7 if Alternative Customer Group 2 were served. This alternative route would replace the proposed North Mainline from MP 247.1 to MP 278.6 (if Group 1) or from MP 255.8 to MP 287.3 (if Group 2). Pipeline construction would be confined entirely within the SP railroad right-of-way, and the route would proceed northwest through San Joaquin and Alameda Counties. Shortly after entering Contra Costa County, the route would cross several water conveyance canals associated with the Clifton Court Forebay (reservoir), pass through Byron, and cross Kellogg Creek and the Main Canal before passing through Brentwood. Continuing northwest, the route would cross Marsh Creek and the Mokelumne Aqueduct, pass through Antioch, Los Medanos, and Pittsburg, and terminate in West Pittsburg.

San Joaquin Valley Pipeline Alternative Route

This route would begin on the North Mainline at MP 236.1 if Alternative Customer Group 1 were served in addition to the Core Customer Group; it would begin at MP 244.7 if Alternative Customer Group 2 were served. This alternative route would replace the proposed North Mainline from MP 247.1 to MP 270.0 (if Group 1) or from MP 255.8 to MP 278.7 (if Group 2). Proceeding northwest, the route would cross unincorporated land in San Joaquin and Alameda Counties. In Alameda County, the route would veer northeast just south of Bethany Reservoir State Recreation Area. The route would enter Contra Costa County, cross Brushy Creek, Kellogg Creek, and Marsh Creek, and pass adjacent to the southwest corner of Brentwood. The route would cross Deer Valley Road in Lone Tree Valley, and rejoin the North Mainline at the eastern edge of Black Diamond Mines Regional Preserve in Antioch.

Interstate 680 Corridor Northward Alternative Route

Joint use of Federal highway rights-of-way by pipelines is prohibited; therefore, this alternative route would be located as close to the highway as possible. Because of the terrain and the residential land use patterns in the area which feature cul-de-sacs instead of grid street patterns, the route would sometimes deviate considerably from the I-680 in order to avoid construction in residential yards to the extent possible. We also evaluated the possible use of the Iron Horse Trail, which parallels I-680 but found that this 100-foot (and in some areas smaller) right-of-way is already used by a number of utilities. This route from Pleasanton to Martinez would replace the proposed North Mainline from MP 247.1 to MP 278.6 if Additional Customer Group 1 were served in addition to the Core Customer Group; it would replace the portion from MP 255.8 to MP 287.3 if Additional Customer Group 2

TABLE 3.3.3.1-1

San Francisco Bay Area Northward Alternative Routes

Route	Route Component	Route Component	Total Route Length (Miles)
Mojave's Proposed North Mainline Route	A From North Mainline/Palo Alto Bifurcation to Contra Loma Regional Park, 22.9 miles	B From Contra Loma Regional Park to Concord Naval Weapons Station (CNWS), 8.6 miles	31.5
Tracy to Antioch Southern Pacific Railroad Alternative Route	D From Tracy Segment to Antioch Segment, 31.5 miles	E From Antioch Segment to CNWS, 3.5 miles	35
San Joaquin Valley Pipeline Alternative Route	F From North Mainline west of Tracy to Contra Loma Regional Park, 27.5 miles	B From Contra Loma Regional Park to CNWS, 8.6 miles	36.1
I-680 Corridor Northward Alternative Route a/	G From Oakland Segment east of Dublin to Martinez, 26.3 miles	C From Martinez to CNWS, 11.5 miles	37.8

---

a/ In order to serve the same customers, this route would be extended 3.5 miles from Concord east to Antioch; the other alternative routes would serve these customers as they go west to Concord and would continue beyond the CNWS to serve customers in Martinez.

were served. Beginning just north of the intersection of I-680 and I-580 at MP 10.8 of the Oakland Segment, the route would go north through the communities of Dublin, San Ramon, Danville, Walnut Creek, Pleasant Hill, and Concord and rejoin the North Mainline on the east side of Martinez. The unincorporated communities of Alamo and Pacheco would also be crossed. The pipeline would be in city streets or on private property adjacent to the east side of the I-680 right-of-way except where the route would shift to follow Main Street, 0.5 mile east of I-680, in Walnut Creek. The route would cross the Contra Costa Canal, Mokelumne Aqueduct, Grayson Creek, and other water bodies.

Environmental Comparison

We developed a list of environmental indicators to use in comparing the effects of the proposed and alternative routes on environmental resources in order to determine which alternative routes to evaluate further. The indicators are representative of all of the resources that would be affected by the proposed project and were used to screen the alternatives to determine which should be analyzed further. Aerial photographs and available maps and plans were used for this screening analysis to provide comparable data for all alternatives. The indicators and how they were measured are:

- Miles of pipeline — Miles of pipeline required to deliver natural gas to all proposed customers in the area after diverging from and rejoining the proposed route at the designated points.
- Miles of wetlands crossed — Wetlands measured on NWI maps plus 50 feet per stream crossed.
- Miles of slopes crossed steeper than 15 percent — Taken from Alameda and Contra Costa Counties' General Plan Seismic Safety Element and cross-checked with USGS maps where available.
- Miles of potential landslides crossed — Taken from Alameda and Contra Costa Counties' General Plan Seismic Safety Element and cross-checked with USGS maps where available.
- Acres of construction right-of-way required — Calculated from miles of pipeline, converted to feet, multiplied by the width of the construction right-of-way (65 feet), and converted to acres.
- Acres of permanent right-of-way required — Calculated from miles of pipeline, converted to feet, multiplied by the width of the permanent right-of-way (10 feet), and converted to acres.
- Acres of urban land affected — Length of urban land uses taken from aerial photographs based on the width of the construction right-of-way.
- Acres of orchards and vineyards affected — Length of orchards and vineyards crossed taken from aerial photographs based on the width of the construction right-of-way.
- Acres of potential special status species habitat affected — Length of nonnative grasslands, wetlands/marsh, and woodlands taken from aerial photographs based on the width of the construction right-of-way.

- Number of residences within 50 feet of the construction right-of-way — Taken from aerial photographs.
- Number of potentially active seismic faults crossed — Taken from Alameda and Contra Costa Counties' General Plan Seismic Safety Element and cross-checked with USGS maps where available.
- Number of streams/canals crossed — Taken from aerial photographs and USGS maps.

Table 3.3.3.1-2 compares the northward Bay Area alternative routes using the environmental indicators. The table shows that, although it is longer, the Tracy to Antioch Southern Pacific Railroad Alternative Route would use existing rights-of-way for more of its distance, affect fewer wetlands, and effectively eliminate the potential effects of geologic hazards on the pipeline. It would greatly reduce the acres of potential special status species habitat affected and come within 50 feet of fewer residences. On the basis of these indicators, it is a viable, potentially environmentally preferable alternative that was carried forward for further analysis.

The impact of the San Joaquin Valley Pipeline Northward Alternative Route would be comparable to that of the proposed route. The alternative route would be longer but have slightly fewer miles of pipeline in areas with steep slopes. It would cross no areas of potential landslides or high liquefaction potential but would cross significantly more potentially active seismic faults. It would also cross significantly more streams, come within 50 feet of more residences, and could affect more acres of potential special status species habitat. Nevertheless, because the route was previously certified in an EIR/EIS, it was carried forward for further consideration.

The I-680 Corridor Northward Alternative Route would also be longer and without environmental benefit. It would affect significantly more wetlands, have potentially greater geotechnical effects, and come within 50 feet of significantly more residences. Although the acres of potential special status species habitat affected would be reduced, they would include more small areas interspersed with urban development, which would be qualitatively greater impact than that on the larger tracts of undeveloped land affected by the proposed pipeline route. For these reasons, we determined that this alternative would not be environmentally preferable to the proposed route and eliminated it from further consideration.

3.3.3.2 Southward and Westward Alternative Routes

During scoping, the Santa Clara County Parks and Recreation Department and the East Bay Regional Parks District requested that we evaluate alternatives to avoid the Mission Peak area including routes in existing highway or existing or abandoned railroad rights-of-way. These agencies consider Mission Peak to be a sensitive area with geologic conditions unfavorable to a pipeline. The suggestion was also made that, instead of two different pipeline segments crossing the inland ridges paralleling the edge of San Francisco Bay (i.e., the Oakland Segment through Dublin Canyon and the Palo Alto Segment through Scott Creek Valley, which would pass by Mission Peak), the two segments should be combined and cross the ridges only once. Combining the Oakland and Palo Alto Segments for a single ridge crossing would have required changes to the pipeline's design that are considered infeasible from an engineering standpoint because it would require construction parallel to and partially within the Hayward Fault Zone; pipelines are generally routed to cross active faults as close to perpendicular as possible. It would likely be longer and would require more urban construction. For these reasons, it was eliminated from further consideration. On the basis of this suggestion, however, we developed and analyzed two alternatives using existing rights-of-way that cross the ridges: the Livermore-Oakland

TABLE 3.3.3.1-2

Comparison of San Francisco Bay Area Northward Alternative Routes With Mojave's Proposed North Mainline

Environmental Indicator	Mojave's Proposed North Mainline Route	Tracy to Antioch Southern Pacific Railroad Alternative Route	San Joaquin Valley Pipeline Alternative Route	I-680 Corridor Alternative Route
Miles of pipeline	31.5	35.0	36.1	37.8
Miles within or adjacent to existing ROW	6.0	35.0	19.8	22.6
Acres of construction ROW required	248.2	275.8	284.4	297.8
Acres of permanent ROW required	38.2	42.4	43.8	45.8
Number of potentially active seismic faults cross	2	1	2 a/	3
Miles of slopes >15% crossed	27.8	0.0	25.5	15.5
Miles of potential landslides crossed	18.3	0.0	7.5	0.8
Miles of high liquefaction potential crossed	1.4	0.0	2.5	8.7
Number of streams/canals crossed	11/2	9/16	60/1	12/3
Miles of wetlands crossed	1.08	0.12	0.79	6.85
Acres of potential special status species habitat affected	210.2	27.6	236.8	122.5
Acres of urban/industrial land affected	16.5	52.0	18.1	81.54
Acres of agricultural cropland affected	3.15	8.06	9.14	6.93
Acres of orchards and vineyards affected	0.0	0.40	5.75	4.57
Number of residences within 50 feet of the construction	124	32	≥162	594

---

a/ Crosses two named faults (Brentwood and Davis) and seven unnamed, inferred, concealed faults of unknown activity.

Railroad Right-of-Way Westward Alternative Route and the Interstate 680 Corridor Southward Alternative Route. These are shown on figure 3.3.3-1 and described in table 3.3.3.2-1 and below.

Livermore-Oakland Railroad Right-of-Way Westward Alternative Route

Following railroad rights-of-way from Livermore to Oakland, this 34.65-mile-long route would replace the proposed Oakland Segment from MP 0 to MP 25. The pipeline would be constructed within the joint Southern Pacific-Union Pacific Railroad right-of-way through Livermore west to Pleasanton, passing adjacent to Shadow Cliffs Regional Preserve and the Alameda County Fairgrounds in Pleasanton (on the Union Pacific Railroad right-of-way). After proceeding south, then west through Niles Canyon on the Southern Pacific Railroad right-of-way, the route would pass through Union City, Fremont, Hayward, San Lorenzo, and San Leandro on the Southern Pacific Railroad right-of-way. The pipeline would be constructed through densely developed urban, industrial, and residential areas except for the sparsely developed Niles Canyon and rural areas between Livermore and Pleasanton. The route would cross under I-680 and numerous city streets. It would rejoin the Oakland Segment on the Southern Pacific Railroad right-of-way at MP 25.

Although there are no immediate development plans, Alameda and Contra Costa Counties have been purchasing portions of the Southern Pacific Railroad right-of-way as it becomes available in anticipation of future development as a light rail transportation corridor. Currently, Southern Pacific has abandoned the right-of-way and removed all of the track between the Niles District of Fremont and Tracy. The Southern Pacific tracks in Niles Canyon have been rebuilt as a tourist rail. Alameda County now owns 35 miles of the right-of-way including from near Stanley Boulevard in Pleasanton to Mission Boulevard in Fremont and from Greenville Road in Livermore east to the San Joaquin County line and hopes to purchase another 20 miles. A high pressure petroleum pipeline already exists in the right-of-way, and the Alameda County Public Works Department believes that permitting another pipeline in the right-of-way would impair the County's ability to develop light rail in the future (Fenstermacher, 1994, personal communication). It is, therefore, uncertain whether this alternative could be implemented.

Interstate 680 Corridor Southward Alternative Route

This route would replace the proposed Palo Alto Segment from MP 13.0 to MP 24.8 in Alameda County. The route would follow I-680 from south of Pleasanton to Fremont but leave I-680 south of Sunol Valley to follow Mission Boulevard in Fremont. The route would cross under I-680 and proceed southwest to parallel I-880, the Nimitz Freeway, and join the Fremont Segment 2.1 miles north of its junction with the Palo Alto Segment (at MP 24.8 on the Palo Alto Segment). The 8.4-mile-long alternative route would replace 11.8 miles of the Palo Alto Segment but would require resizing a portion of the Fremont Segment from MP 0 to MP 2.1.

Environmental Comparison

Table 3.3.3.2-2 compares the two southward alternative routes using the environmental indicators described in section 3.3.3.1. The Livermore-Oakland Westward Alternative Route would be substantially longer than the proposed route. It would cross significantly more miles with landslide potential, affect more than twice as many residences within 50 feet of the pipeline, and affect more acres of potential special status species habitat. In particular, the use of Niles Canyon would not be environmentally preferable to the proposed route because slopes are extremely steep (on the order of 35 percent in some areas), the potential special status species habitat is oak and other woodlands, and considerably

TABLE 3.3.3.2-1

San Francisco Bay Area Southward and Westward Alternative Routes

Route	Route Component	Route Component	Total Route Length (Miles)
Mojave's Proposed Oakland Segment	A From Palo Alto Segment/Oakland Segment junction to intersection with SPRR/Union Pacific RR in east Pleasanton, 5.6 miles	B From intersection with SPRR/Union Pacific RR in east Pleasanton to intersection with SPRR in San Leandro, 19.4 miles	25.0
Livermore-Oakland Railroad Right-of-Way Westward Alternative Route	C From North Mainline, north of North Mainline/Palo Alto bifurcation, to intersection with Mojave's proposed Oakland Segment in east Pleasanton, 8.8 miles	D From intersection with Mojave's proposed Oakland Segment in east Pleasanton to intersection with Mojave's proposed Oakland Segment in San Leandro, 25.85 miles	34.65
Mojave's Proposed Palo Alto Segment	From Junction with Palo Alto Segment and I-680 at Scotts Corner to Junction of Palo Alto and Fremont Segments		11.8
I-680 Corridor Southward Alternative Route	From Junction with Palo Alto Segment and I-680 at Scott's Corner to intersection of I-680 and Fremont Segment east of Nimitz Freeway (I-880)		8.4

TABLE 3.3.3.2-2

Comparison of San Francisco Bay Area Southward and Westward Alternative Routes With Mojave's Proposed Oakland and Palo Alto Segments

Environmental Indicator	Mojave's Proposed Oakland Segment	Livermore-Oakland Railroad Right-of-Way Westward Alternative Route	Mojave's Proposed Palo Alto Segment	I-680 Corridor Southward Alternative Route
Miles of pipeline	25.0	34.65	11.8	8.4
Miles within or adjacent to existing ROW	20.5	34.65	5.1	7.9
Miles of wetlands crossed	4.48	3.58	0.0	0.28
Miles of slopes >15% crossed	12.8	6.9	10.3	3.3
Miles of potential landslides crossed	0.7	7.0	8.6	0.2
Miles of high liquefaction potential crossed	11.5	0.0	4.0	0.0
Acres of construction ROW required	197.0	273.0	93.0	66.2
Acres of permanent ROW required	30.3	42.0	14.3	10.2
Acres of urban/industrial land affected	90.6	90.1	12.6	9.5
Acres of agricultural cropland affected	1.6	9.5	3.1	0.0
Acres of orchards and vineyards affected	3.9	0.0	3.4	2.9
Acres of potential special status species habitat affected	65.7	95.2	84.7	35.7
Number of residences within 50 feet of the construction	220	507	28	74
Number of potentially active seismic faults cross	4	5	3	3
Number of streams/canals crossed	14/3	12/1	5/2	17/2

more blasting would be required. In addition, Niles Canyon is subject to flash floods. For these reasons, this alternative was eliminated from further consideration.

The I-680 Corridor Southward Alternative Route would offer some advantages over the proposed route. It would be shorter and cross fewer miles of potential landslides and areas with high liquefaction potential. It would affect fewer acres of potential special status species habitat; however, more than twice as many residences would be within 50 feet of the right-of-way, and three times as many streams would be affected. Because this alternative could potentially be environmentally preferable to the proposed route, it was carried forward for further consideration.

3.4 MINOR ROUTE VARIATIONS

Route variations are intended to resolve localized resource issues such as avoiding or minimizing construction in city streets or near residences. As part of the scoping process, we contacted the planning department of each city crossed by the proposed route. We received 12 recommendations for minor route variations designed to minimize local impact in the San Francisco Bay Area. No route variations were suggested by planning departments, government agencies, or local organizations in the Mojave Desert or Central Valley. The 12 suggested variations are listed in table 3.4-1 and discussed below.

Livermore

In the Livermore area, suggestions for route variations were made by the City of Livermore Planning Department and Tri-Valley Associates, private landowners. The Livermore/Railroad and South Livermore/Aqueduct Route Variations suggested by the City of Livermore are shown in figure 3.4-1. The Tri-Valley/Greenville Road Route Variation, shown in figure 3.4-2, is immediately east and north of the eastern end of the Livermore/Railroad Route Variation. The City of Livermore suggested that the pipeline avoid the use of grassy fields designated in the South Livermore Valley Area Plan for future agricultural use, primarily vineyards and orchards (Brown et al., 1994, personal communication). This plan allows higher density residential development in specified areas provided developers maintain other land for permanent agricultural use (see section 5.7 for a summary of the goals of this plan). The Tri-Valley Associates are concerned about the future market value of their industrially zoned land and development constraints that would result if their property were bisected by a new right-of-way (Gibbons, 1994, personal communication).

The Livermore/Railroad Route Variation would use the existing SP railroad right-of-way through downtown Livermore and the Tri-Valley Associates land. This 100- to 300-foot-wide right-of-way is owned by the SP railroad and used by Union Pacific trains. Reportedly, much of the right-of-way width is unused. The variation would provide a more direct route between the Palo Alto Segment at MP 0.5 and the Oakland Segment at MP 5.6. Mojave has stated that vineyards could be planted after construction and that, since topsoil would be segregated and replaced, no decline in soil fertility would result. The proposed route would, therefore, not impair the preservation of vineyards; preserving and expanding vineyards are the goals of the South Valley Area Plan. The Livermore/Railroad Route Variation passes through Livermore where residences and commercial establishments would be affected by construction noise and minor traffic disruptions. This variation is a portion of the Railroad Right-of-way Southward Alternative Route discussed in section 3.3.3.2 and could be adopted independent of the balance of that alternative route; however, because its use could conflict with Alameda County's long-range light rail transportation plans, it may not be feasible.

TABLE 3.4-1

Route Variations

Agency/Organization That Suggested Variation	Issues Addressed or Reason for Variation	Pipeline Segments and Mileposts	Suggested Variation
City of Livermore Planning Department	Avoid designated agricultural land in South Livermore Valley Area, two planned residential developments, and Sycamore Grove Regional Park.	North Mainline (MP 246.0) to Oakland Segment (MP 5.6)	**Livermore/Railroad Variation:** Use SP railroad ROW through downtown Livermore, which ranges from 100 to 300 feet wide and is largely unused.
		North Mainline (MP 244.2) to Palo Alto Segment (MP 7.5) to Oakland Segment (MP 0.0 to MP 7.5)	**South Livermore/Aqueduct Variation:** Follow South Bay Aqueduct to proposed route to Isabelle Avenue, then proceed northward along Isabelle Avenue to I-580. (Isabelle Avenue is planned for Route 84 bypass/tollroad and I-580 interchange.)
Tri-Valley Associates	Avoid bisecting heavy industrial and designated future industrial area.	North Mainline (MP 244.8 to MP 246.5)	**Tri-Valley/Greenville Road Variation:** Align pipeline along Greenville Road.
City of Pleasanton Planning Department	Avoid use of road ROWs in Pleasanton to avoid interfering with roadside tree planting requirements; concerns about adequacy of road restoration; avoid residential areas.	Oakland Segment (MP 2.0 to MP 6.75)	**Northeast Pleasanton Variation:** From Vineyard Avenue, proceed north along Isabelle Avenue, west on Stanley Boulevard, and north on El Charro Road along the El Arroyo Mocho.
		Proposed segment to San Leandro, alternative route on west side of Pleasanton (MP 0.0 to MP 8.5)	**Pleasanton/Ridge Variation:** Use existing utility right-of-way on undeveloped Pleasanton Ridge on the west side of the City of Pleasanton.
City of San Carlos Planning Department	Avoid disturbance to railroad track embankment created by city grade separation project.	Hunters Point Segment (MP 6.5 to MP 8.4)	**San Carlos/Railroad Variation:** Align pipeline adjacent to embankment toe-of-slope on west side of railroad where a 40- to 50-foot wide-open-space ROW will be established between the railroad and El Camino Real.
	Consider whether San Carlos/Railroad Route Variation is feasible.	Hunters Point Segment (MP 6.5 to MP 8.4)	**San Carlos/East Side Old County Road:** Align pipeline on east side of Old County Road instead of west side as proposed.

TABLE 3.4-1 (cont'd)

Agency/Organization That Suggested Variation	Issues Addressed or Reason for Variation	Pipeline Segments and Mileposts	Suggested Variation
City of Fremont Planning and Public Works Departments	Concern about physical space constraints for new underground utility development along Automall Parkway (formerly Durham Road).	Fremont Segment (MP 4.5 to MP 5.1)	**Fremont/Automall Parkway Variation:** Construct pipeline in center island of Automall Parkway instead of on south side as proposed.
	Concern about pipeline construction proximity and disturbance to top edge of vertical embankment above groundwater recharge pond.	Fremont Segment (MP 13.3 to MP 13.8)	**Fremont/Southside Railroad Route Variation:** Align pipeline along south side of railroad ROW instead of north side as proposed.
City of Santa Clara Planning Department	Avoid/minimize construction impact on city streets and landowners.	Palo Alto Segment (MP 37.8 to MP 38.8)	**Santa Clara/Railroad Variation:** Use existing SP ROW instead of road ROW as proposed.
City Antioch	Avoid/minimize use of residential streets in Antioch.	Antioch Segment (MP 2.5 to end)	**Antioch/Railroad Variation:** Align to stay on the A, T, & SF ROW to delivery point.
		Antioch A-174 Segment (MP 3.0 to end)	**Antioch/Wilber Avenue Variation:** Stay on railroad ROW east to Cavallo Road, proceed north to Wilber Avenue, then proceed east to delivery point.

Palo.CDR

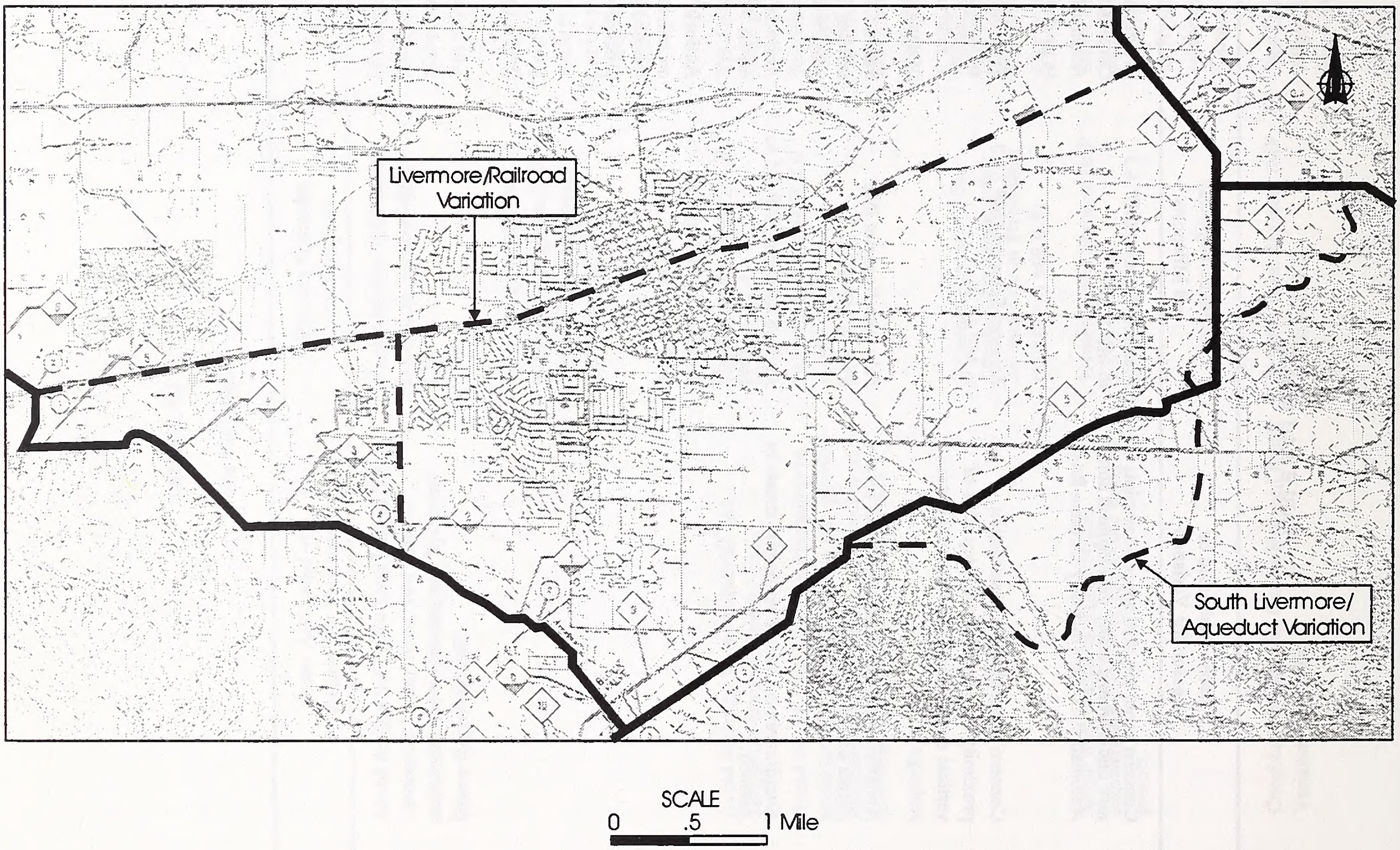

Livermore/Railroad Variation
South Livermore/ Aqueduct Variation
SCALE
0
.5
1 Mile

Figure 3.4-1 Livermore/Railroad and South Livermore/Aqueduct Route Variations
Note: Map presented to show proposed route (solid lines) and variations (broken lines) only; disregard base map symbols.

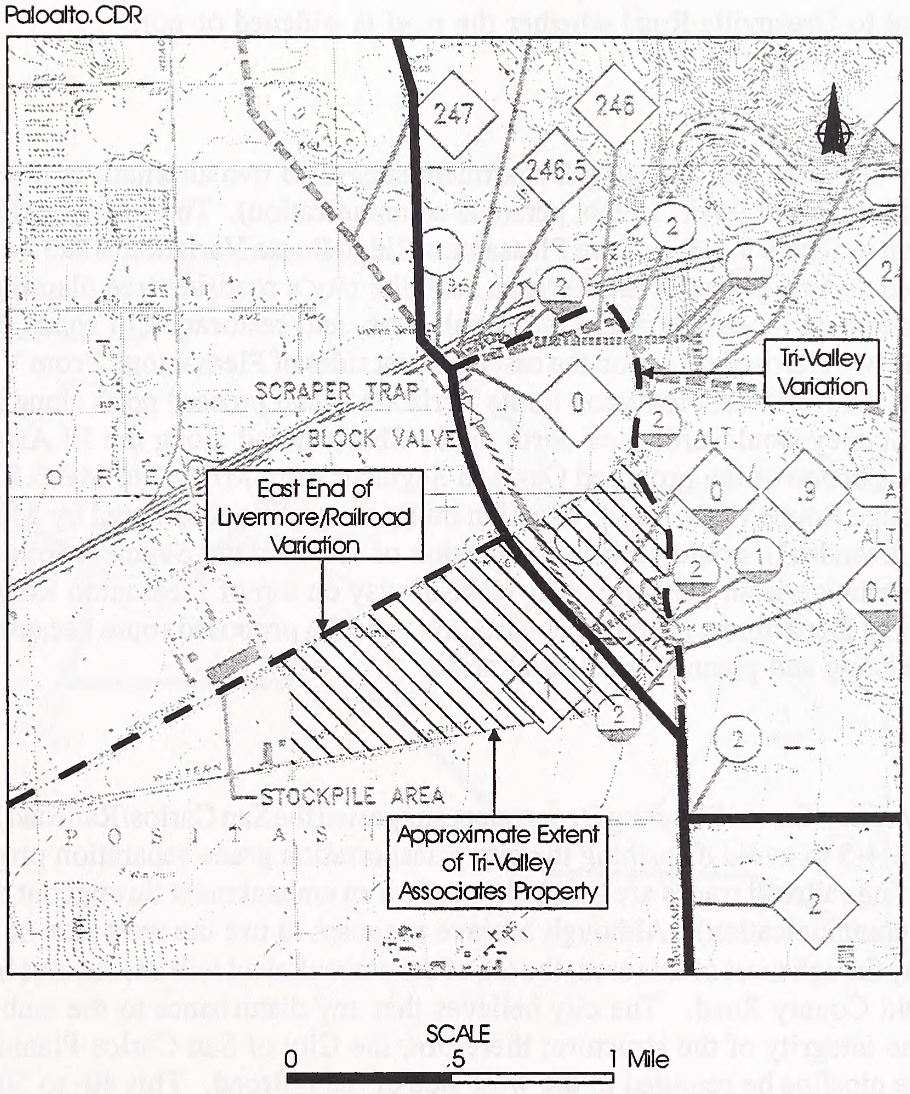

Paloalto.CDR
247
246
246.5
2
1
2
2
Tri-Valley Variation
SCRAPER TRAP
0
2
ALT
BLOCK VALVE
East End of Livermore/Railroad Variation
.9
0
ALT
1
2
1
1
2
2
STOCKPILE AREA
POSITAS
Approximate Extent of Tri-Valley Associates Property
2
SCALE
0
.5
1 Mile

Figure 3.4-2 Tri-Valley/Greenville Road Route Variation
Note: Map presented to show proposed route (solid lines) and variations (broken lines) only; disregard base map symbols.

The City of Livermore also suggested the South Livermore/Aqueduct Route Variation (Brown et al., 1994, personal communication). This alignment would use infrastructure easements associated with the South Bay Aqueduct and the powerline corridor south of the proposed route as an alternative to crossing areas designated for vineyards and orchards.

The Tri-Valley Associates' suggested Tri-Valley/Greenville Road Route Variation would use Greenville Road as an alternative to the South Livermore/Aqueduct Route Variation. The City of Livermore proposes to annex and widen portions of Greenville Road. The pipeline could be aligned within or adjacent to Greenville Road whether the road is widened or not.

Pleasanton

The City of Pleasanton Planning Department suggested two alternatives to avoid using road rights-of-way in Pleasanton (Swift, 1994b, personal communication). The Northeast Pleasanton Route Variation is shown in figure 3.4-3, and the Pleasanton/Ridge Route Variation is shown in figure 3.4-4. Concerns centered around potential interference with the city's roadside tree planting requirements, pipeline construction and operation near residential areas, and restoration of roads disturbed during construction. The two alternatives are on the east and west sides of Pleasanton. From Vineyard Avenue east of Pleasanton, the Northeast Pleasanton Route Variation would proceed north along Isabelle Avenue, turn west along Stanley Boulevard, then north on El Charro Road along the El Arroyo Mocho. It would replace the portion of the proposed Oakland Segment from MP 2.0 to MP 6.8. Alternatively, the Pleasanton Ridge Route Variation, a variation on an alternative considered by Mojave (called the "pipeline to San Leandro") would replace the portion of the Oakland Segment from MP 0 to about MP 12.1. This variation is an existing utility right-of-way on top of Pleasanton Ridge. The City of Pleasanton Planning Department prefers this variation over the proposed route because it would avoid city roads and existing and planned residential areas.

San Carlos

The City of San Carlos Planning Department suggested the San Carlos/Railroad Route Variation shown in figure 3.4-5 to avoid disturbing the city transportation grade separation project in progress in which the existing railroad tracks are being elevated on an embankment throughout the city (Martin, 1994a, personal communication). Although Mojave proposes to use the west side of the Old County Road right-of-way though most of this area, the toe of the embankment will extend east from the railroad to the edge of Old County Road. The city believes that any disturbance to the embankment would likely threaten the integrity of the structure; therefore, the City of San Carlos Planning Department requested that the pipeline be rerouted to the west side of the railroad. This 40- to 50-foot-wide area between the railroad and El Camino Real will be established as open space with a parking area following completion of the grade separation; however, the west side of the railroad right-of-way is currently being used as a railroad detour during the grade separation construction and will be full of railroad tracks until 1997 or 1998 when the project is completed. This is a potential timing conflict with the projected construction schedule. Alternatively, it may be possible to align the pipeline on the east side of Old County Road although industrial, commercial, and residential development exists at a 15-foot setback from the road right-of-way.

Oakland.CDR

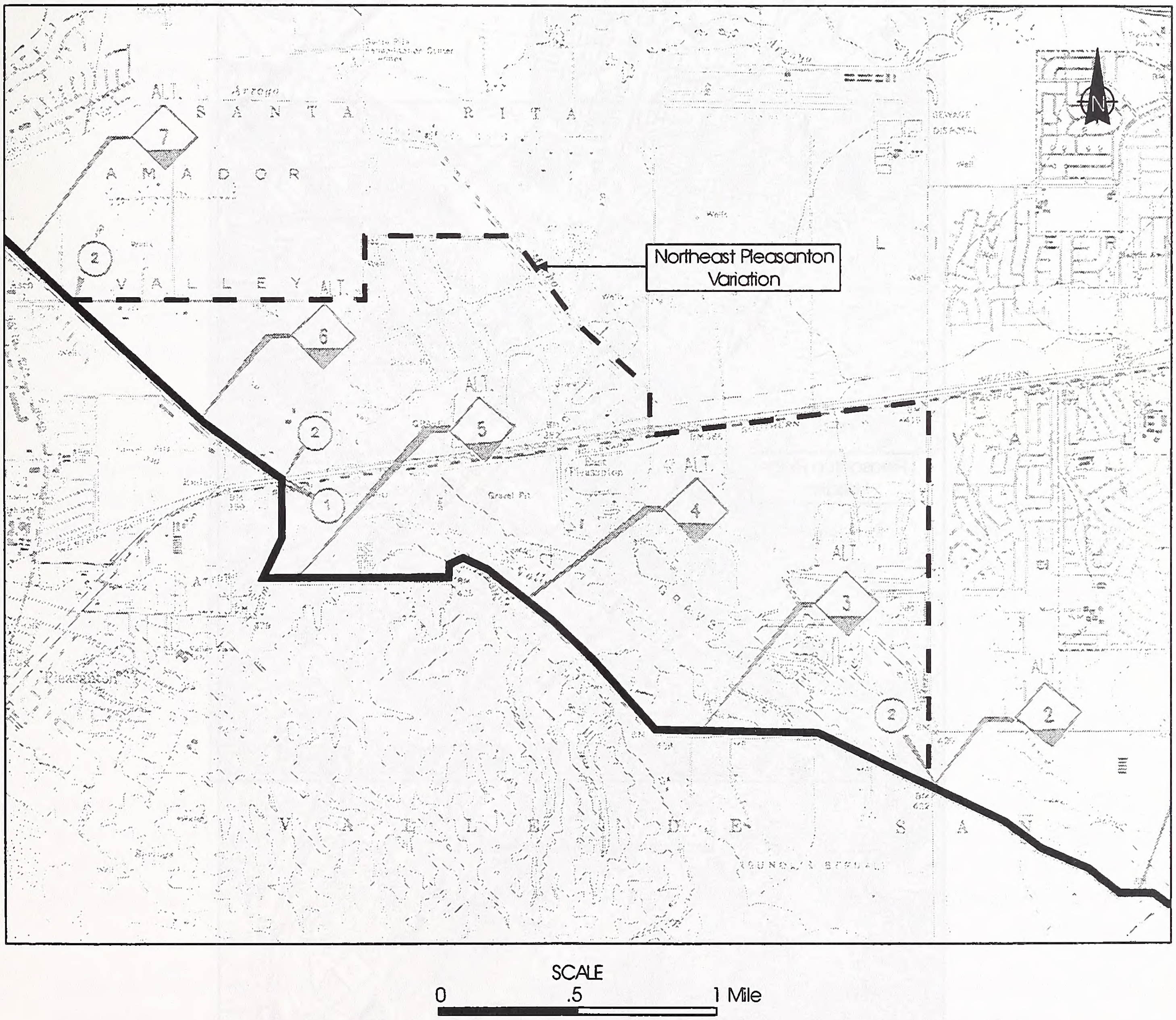

Northeast Pleasanton Variation
ALT.
7
6
5
4
3
2
1
SANTA RITA
AMADOR
VALLEY
VALLE DE SAN
Pleasanton
Gravel Pit
SEWAGE DISPOSAL
N
SCALE
0
.5
1 Mile

Figure 3.4-3 Northeast Pleasanton Route Variation
Note: Map presented to show proposed route (solid lines) and variations (broken lines) only; disregard base map symbols.

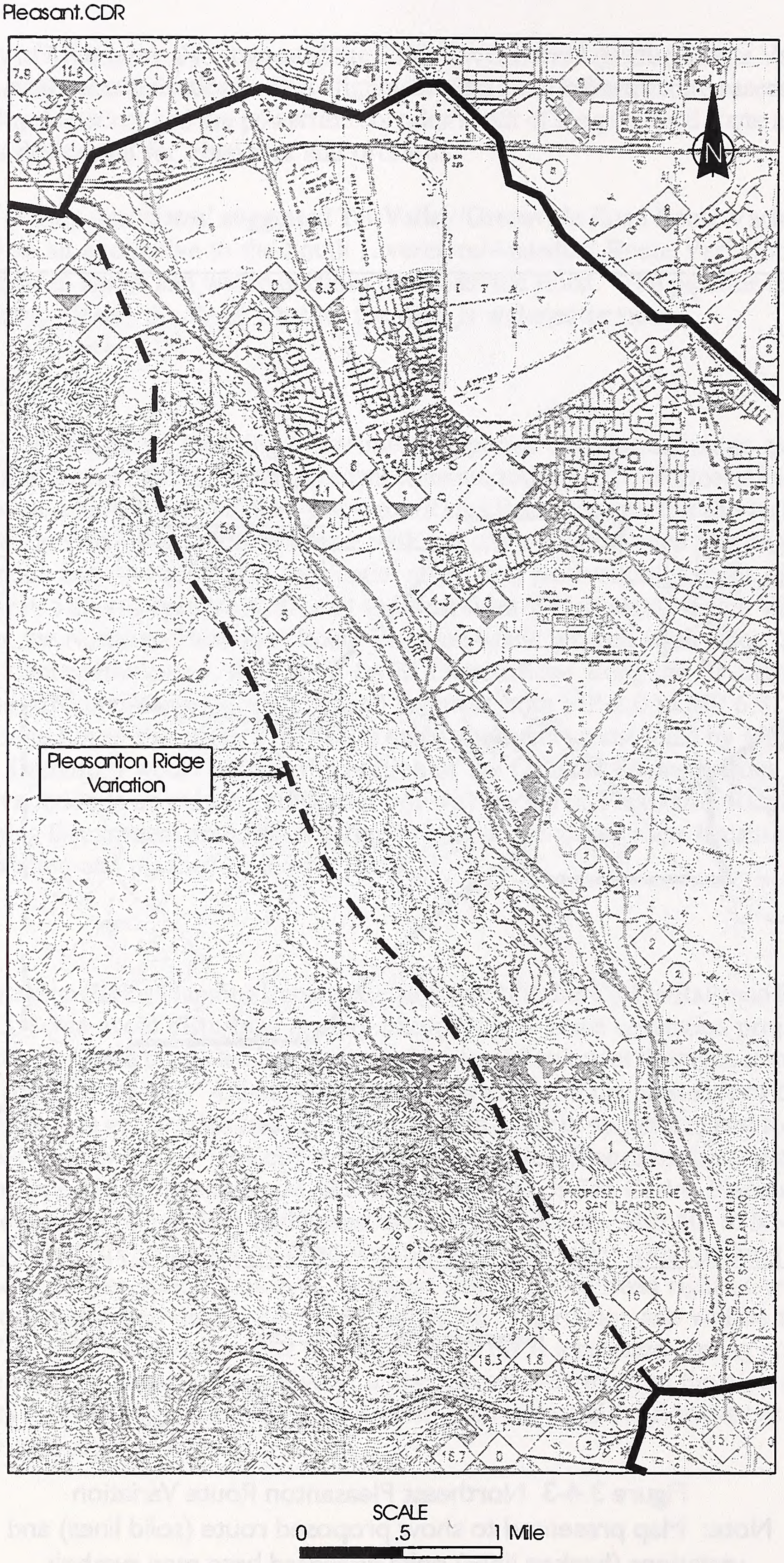

Pleasant.CDR
N
Pleasanton Ridge Variation
PROPOSED PIPELINE TO SAN LEANDRO
SCALE
0
.5
1 Mile

Figure 3.4-4 Pleasanton/Ridge Route Variation
Note: Map presented to show proposed route (solid lines) and variations (broken lines) only; disregard base map symbols.

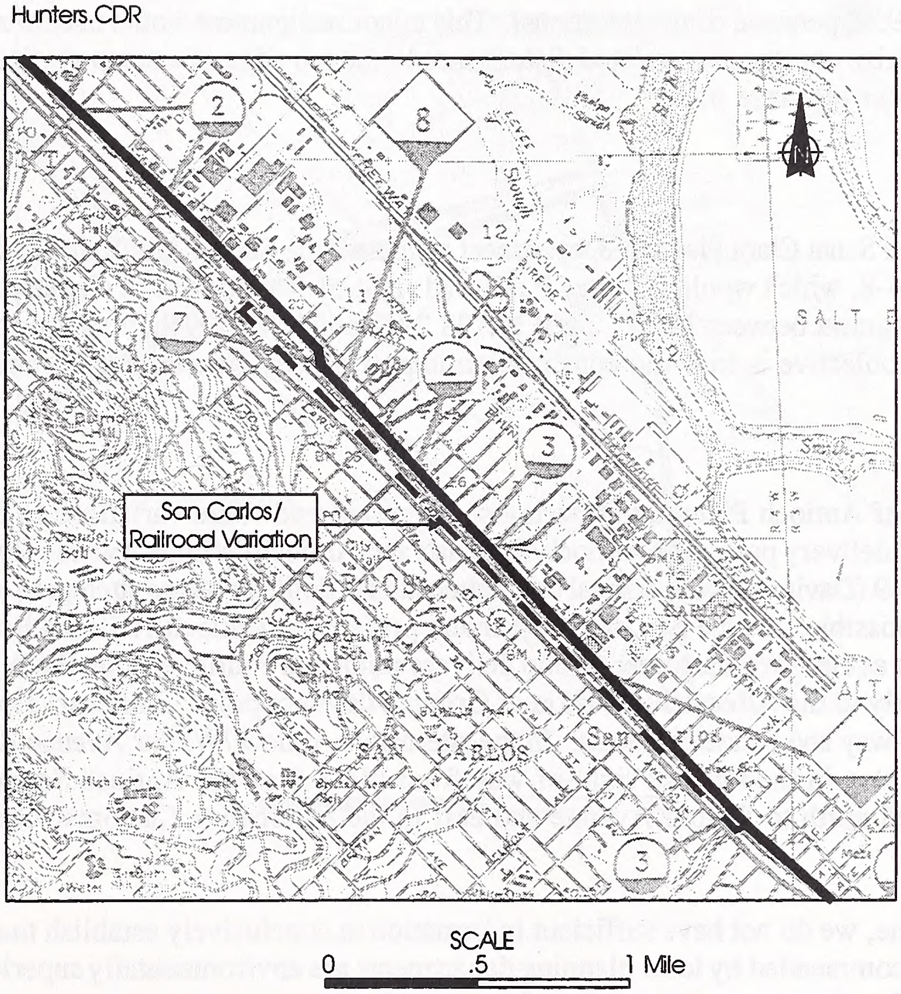

Hunters.CDR
2
8
12
11
7
2
3
SALT
San Carlos/
Railroad Variation
SAN CARLOS
7
3
SCALE
0
.5
1 Mile

Figure 3.4-5 San Carlos/Railroad Route Variation
Note: Map presented to show proposed route (solid lines) and variations (broken lines) only; disregard base map symbols.

Fremont

The City of Fremont Planning and Public Works Departments are concerned about physical space limitations for new underground utilities along Automall Parkway (formerly Durham Road). They proposed the Fremont/Auto Mall Parkway Route Variation shown in figure 3.4-6, which would move the portion of the Fremont Segment between MP 4.5 and MP 5.1 from the south side of the road right-of-way to the grassy center median strip. They also suggested the Fremont/Southside Railroad Route Variation shown in figure 3.4-7, which would move the portion of the Fremont Segment between MP 13.5 and MP 14.0 from the north to the south side of the railroad right-of-way (Harbin, 1994, and Harbin et al., 1994, personal communications). This minor realignment would maximize the separation distance and minimize construction-related disturbance to the top edge of a steep vertical embankment above a groundwater recharge pond.

Santa Clara

The City of Santa Clara Planning Department suggested the Santa Clara/Railroad Route Variation shown in figure 3.4-8, which would use the SP railroad right-of-way instead of city streets as proposed for the Palo Alto Segment between MP 37.2 and MP 38.2 (Goodfellow, 1994b, personal communication). The department's objective is to avoid construction impact on city streets, traffic, and landowners.

Antioch

The City of Antioch Planning Department suggested two route variations to the Alternative Customer Group 2 delivery point, the Antioch/Railroad and Antioch/Wilbur Avenue Route Variations shown in figure 3.4-9 (Davis, 1994b, personal communication). Both variations attempt to avoid residential areas as much as possible. Of the two, the department prefers the Antioch/Railroad Route Variation, which would begin at the Core Customer Group delivery point and continue along the AT&SF railroad right-of-way directly to the Alternative Customer Group 2 delivery point. This variation avoids using city street rights-of-way and residential areas. In the alternative Antioch/Wilbur Avenue Route Variation, the pipeline could stay in the railroad right-of-way from MP 3.0 on the Antioch Segment to Cavallo Road, then proceed north to Wilbur Avenue and east to the Alternative Customer Group 2 delivery point.

At this time, we do not have sufficient information to conclusively establish that the 12 minor route variations recommended by local planning departments are environmentally superior to Mojave's proposed route in these locations. We are therefore, specifically requesting comments on the feasibility and environmental impact associated with the construction of these 12 alternative routes from all interested individuals. In addition:

- **We recommend that Mojave conduct a detailed environmental, engineering, and economic analysis for each of these alternative routes and submit this information for inclusion and analysis in our final EIR/EIS.**

All information provided to us will be considered and analyzed in our final EIR/EIS, and we will recommend a final route alignment for Mojave's facilities through these locations at that time.

We also identified and evaluated numerous small route variations designed to reduce or eliminate effects on one or more resources in specific locations. In addition, Mojave has committed to avoid all cultural resources and vernal pools.

Fremont.CDR

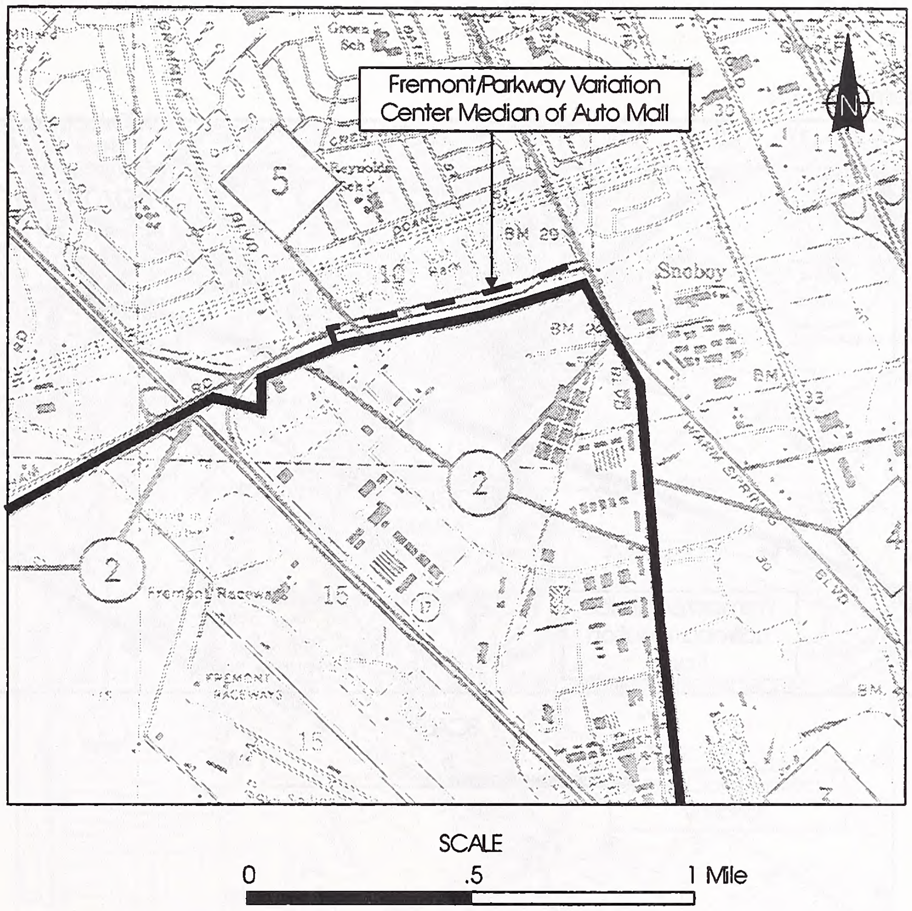

Fremont/Parkway Variation
Center Median of Auto Mall
N
5
2
2
4
Fremont Raceway
FREMONT RACEWAYS
Snoboy
SCALE
0
.5
1 Mile

Figure 3.4-6 Fremont/Auto Mall Parkway Route Variation
Note: Map presented to show proposed route (solid lines) and variations (broken lines) only; disregard base map symbols.

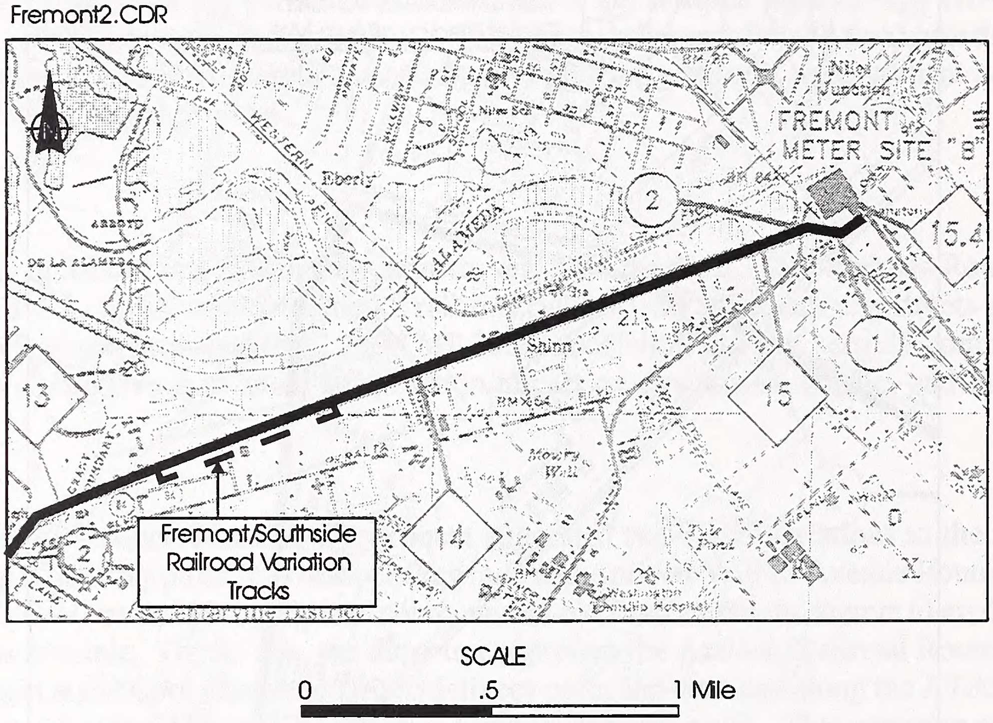

Fremont2.CDR
FREMONT METER SITE "B"
Niles Junction
2
15.4
1
15
13
14
2
Shinn
Fremont/Southside Railroad Variation Tracks
SCALE
0
.5
1 Mile

Figure 3.4-7 Fremont/Southside Railroad Route Variation
Note: Map presented to show proposed route (solid lines) and variations (broken lines) only; disregard base map symbols.

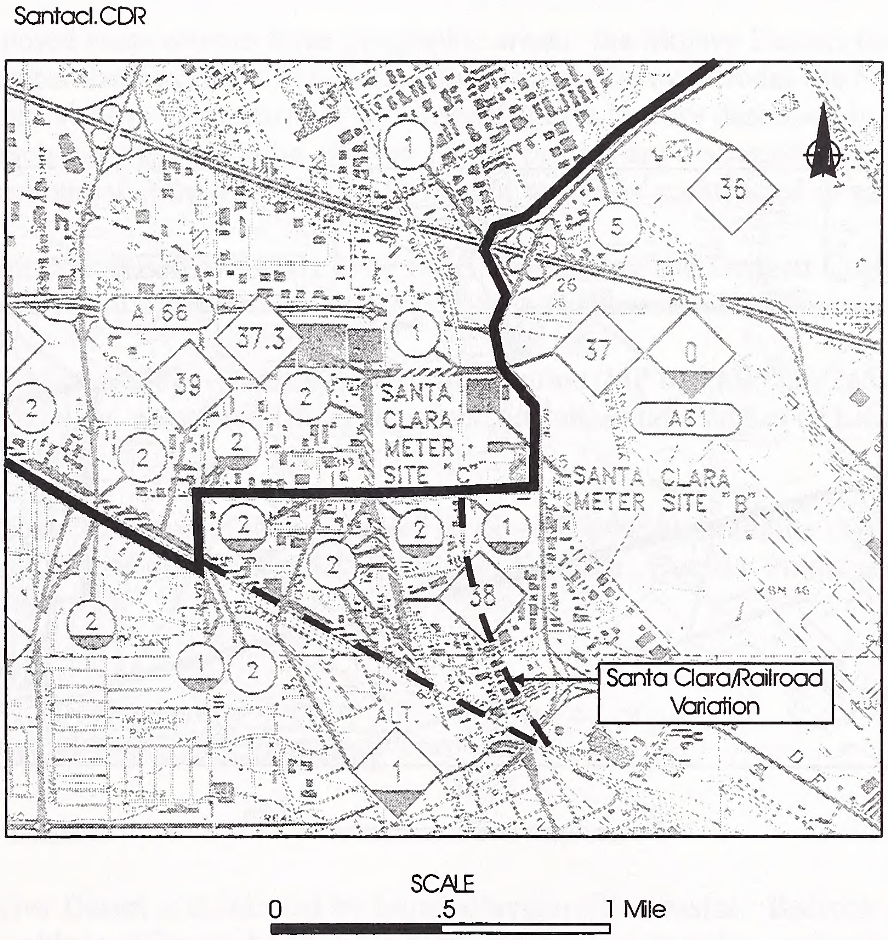

Santacl.CDR
A166
37.3
39
SANTA CLARA METER SITE "C"
SANTA CLARA METER SITE "B"
36
5
26
37
0
A61
1
2
38
ALT.
Santa Clara/Railroad Variation
SCALE
0
.5
1 Mile

Figure 3.4-8 Santa Clara/Railroad Route Variation
Note: Map presented to show proposed route (solid lines) and variations (broken lines) only; disregard base map symbols.

Antioch.CDR

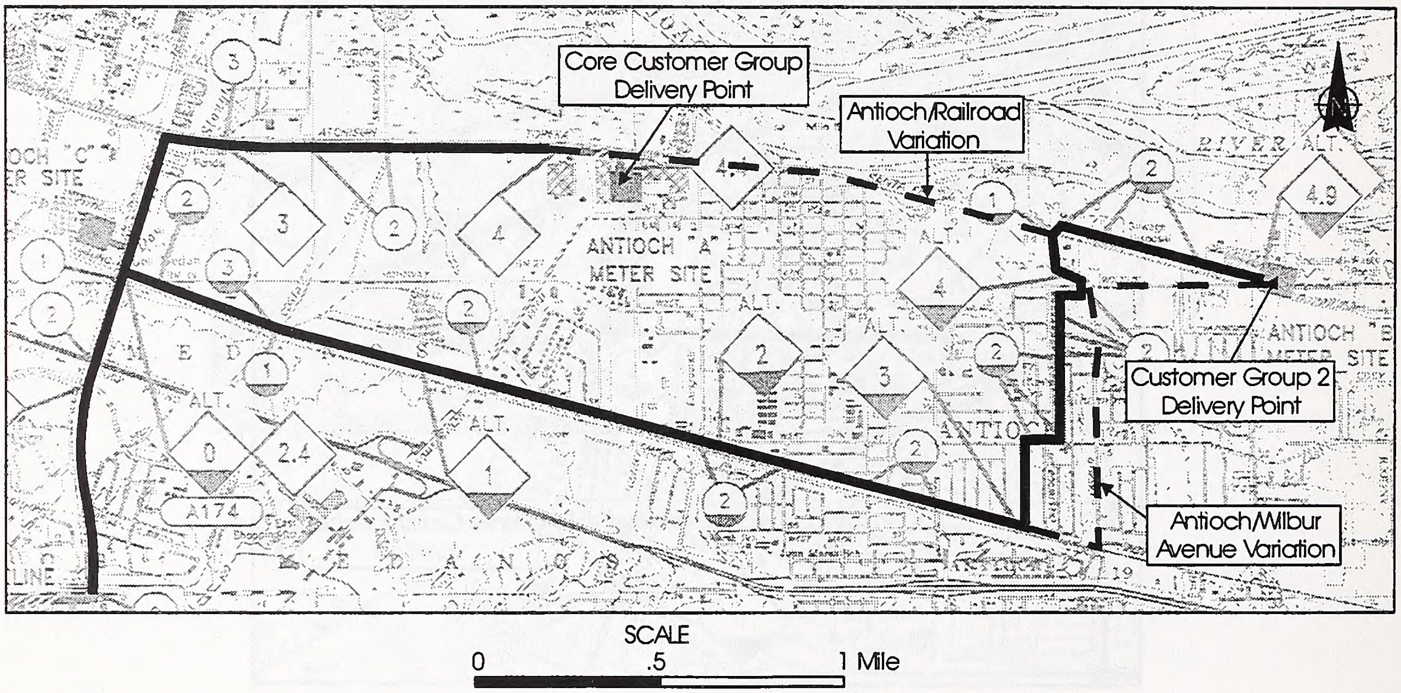

Core Customer Group Delivery Point
Antioch/Railroad Variation
ANTIOCH "A" METER SITE
ANTIOCH "B" METER SITE
Customer Group 2 Delivery Point
Antioch/Wilbur Avenue Variation
RIVER
A174
SCALE
0
.5
1 Mile

Figure 3.4-9 Antioch/Railroad and Antioch/Wilbur Avenue Route Variations
Note: Map presented to show proposed route (solid lines) and variations (broken lines) only; disregard base map symbols.

4.0 AFFECTED ENVIRONMENT

This section summarizes the current conditions of environmental resources that would be affected by the proposed Mojave Northward Expansion Project. The resources were identified and addressed on the basis of comments we received during the scoping process, which involved both private and public groups and individuals. We obtained data by contacting agencies with jurisdiction over the pipeline and facilities, by reviewing information provided such as land use plans and soil surveys, by determining applicable regulatory requirements, by reviewing aerial photographs, maps, and pipeline alignment sheets, and by field checking sensitive areas.

The proposed route crosses three geographic areas: the Mojave Desert, the Central Valley, and the Coast Ranges-San Francisco Bay Area. The Central Valley includes the San Joaquin Valley and the Sacramento Valley. Each area has distinctive features that are described in section 4.1. The environmental resources that would be affected by the project are discussed by geographic area in subsequent subsections of section 4. The facilities that would be constructed in each area are:

- Mojave Desert — Loops 1, 2, and 3, the Amboy and Daggett Compressor Stations, and modifications to the existing Topock Compressor Station.
- Central Valley — Loop 4, the North Mainline (MP 0 to MP 236/245), the Sacramento Mainline, associated lateral segments, and either the Famoso or Lindsay Compressor Station. 1/
- Coast Ranges-San Francisco Bay Area — The North Mainline (MP 236/245 to end) and the Antioch, Palo Alto, Oakland, Fremont, Hunters Point, and San Francisco Segments.

4.1 GEOLOGY

4.1.1 Physiography and Geologic Setting

4.1.1.1 Mojave Desert

The Mojave Desert is dominated by broad alluvium-filled basins. Bedrock geology consists of a complex assemblage of Precambrian to Tertiary granitic, metamorphic, and volcanic rocks. The western portion of the province is cut by active, right-lateral, strike-slip faults that are subparallel to the San Andreas Fault and that appear to be truncated on the north by the Garlock Fault. The specific locations of these features are listed in table 4.1.1.1-1 at the end of section 4.1. The terrain that would be traversed by the proposed loops is generally gentle to moderately steep across alluvial fans and the margins of more mountainous areas. Loop 2 would cross minor rock outcrops. Both the Amboy and Daggett Compressor Stations would be located on the distal edge of an alluvial fan where the terrain slopes to the south and is underlain by fine-grained granular materials.

1/ Where two milepost numbers are given separated by a slash, the first number is the milepost in the pipeline configuration to serve Alternative Customer Group 1 in addition to the Core Customer Group, and the second number is the milepost in the pipeline configuration to serve Alternative Customer Group 2 in addition to the Core Customer Group. Where only one milepost number is given, the pipeline configuration would be the same in that area to serve both alternative customer groups. Where no number is given before or after the slash, the entry only applies to one configuration or the other.

4.1.1.2 Central Valley

The Great or Central Valley is situated between the Sierra Nevada to the east and the Coast Ranges to the west. It extends from the Tehachapi Mountains in the south to the Klamath Mountains in the north. The confluence of the San Joaquin and Sacramento Rivers separates the Central Valley into the northern Sacramento Valley and the southern San Joaquin Valley. The North Mainline would extend northwest along the eastern side of the San Joaquin Valley from the proposed Sycamore Meter Station to about MP 236/245. The North Mainline and numerous segments would cross dissected uplands, low alluvial plains and fans, and river floodplain and channels. The upland topography is irregular with relief on the order of hundreds of feet. The topography on the alluvial plains and fans is characterized by gentle slopes and low relief. Geologic materials crossed would consist predominantly of unconsolidated to moderately consolidated alluvium. Both the Famoso and Lindsay Compressor Stations would be situated on low alluvial plains where the terrain slopes west and is underlain by fine- to medium-grained granular alluvium.

The Sacramento Mainline would extend north from the North Mainline at MP 215.8/224.5 and cross from the San Joaquin Valley to the Sacramento Valley. The topography is relatively flat and underlain by alluvial and fluvial deposits of the San Joaquin River and the drainages that flow west from the Sierra Nevada.

4.1.1.3 Coast Ranges-San Francisco Bay Area

The Coast Ranges form a boundary between the Pacific Ocean and the North American continent. The boundary is characterized by right-lateral, strike-slip faulting and widespread deformation. After leaving the Central Valley west of Tracy, the North Mainline would enter the Coast Ranges near MP 236/245. Other proposed segments within this province are the Palo Alto, Oakland, Fremont, and Antioch Segments. The terrain crossed by the proposed route through the Coast Ranges varies from steep hills to flat valleys. In the San Francisco Bay Area, the Palo Alto and Fremont Segments and the western portion of the Oakland Segment would cross generally flat terrain underlain by bay sediments.

Within the Coast Ranges, the proposed route crosses geologic units consisting predominantly of marine and nonmarine sedimentary rocks. The exceptions are a narrow outcropping of volcanic rocks in the vicinity of North Mainline MP 275.6/284.4. Along the proposed routes of the Palo Alto, Oakland, Fremont, and Antioch Segments, the surficial geology varies from sedimentary and volcanic rock in the upland areas to alluvial deposits in the valleys. The sedimentary and volcanic rocks are variably weathered, have different degrees of hardness and rippability, and range from soft and weak rock that can be excavated easily to hard rock that may require blasting. The slope stability also varies according to the strength characteristics of the rock.

4.1.2 Geologic Hazards

The geologic hazards that may affect the proposed project consist of ground motion due to earthquakes, fault rupture and displacement, slope instability and landsliding, subsidence, liquefaction, settlement, and hydrocompaction. The hazards in each physiographic province are discussed below and listed in table 4.1.1.1-1 at the end of section 4.1.

4.1.2.1 Mojave Desert

The Mojave Desert has a low susceptibility to landsliding primarily because of the lack of steep slopes, and no areas of significant land subsidence have been identified. The geologic hazards that would be encountered along the proposed route through the Mojave Desert are:

- Seismic hazards — Loop 2 would cross the Ludlow Fault at MP 30.4. This fault has displaced Quaternary deposits but has not shown any historic displacement. Loop 3 would cross the South Lockhart Fault between MP 15.5 and MP 17.5 and two splays of an unnamed fault between MP 21.3 and MP 21.4. Both faults are considered active. Ground shaking from earthquakes can occur throughout the Mojave Desert because of its active seismicity. Peak ground accelerations greater than 0.4 g (the force exerted by gravity on a resting body) can occur in the area of Loop 3.

- Subsidence — No areas of subsidence would be crossed by the pipeline in the Mojave Desert.

- Soil liquefaction, settlement, and hydrocompaction — Soil liquefaction could be significant along Loop 3 where the route crosses young alluvium. No areas of settlement or hydrocompaction have been identified that would be crossed by the pipeline in the Mojave Desert.

- Volcanic hazards — Potentially active volcanic hazards occur near the Daggett and Amboy Compression Stations. Amboy Crater is about 13 miles southeast of Amboy, and Pisgah Crater is about 25 miles southeast of Daggett. Both probably erupted in the last 2,000 years.

4.1.2.2 Central Valley

The proposed route crosses generally low relief in the Central Valley with little potential for landsliding. The geologic hazards that could be encountered along the proposed route through the Central Valley are:

- Seismic hazards — Active late Quaternary and Holocene and potentially active Quaternary faults occur near Bakersfield (see table 4.1.1.1-1). Between MP 2.5 and MP 23.5, the Famoso Alternative of the North Mainline would cross at least five faults including the New Hope, Pond-Poso Creek, and Premier Faults. The Lindsay Alternative would cross the New Hope Fault, and the McFarland Segment would cross the Premier and Pond-Poso Creek Faults. North of MP 23.5, the North Mainline would not cross any active faults but would cross numerous areas where earthquake ground shaking could occur. Loop 4 would cross the active White Wolf Fault near MP 0.1, the Edison Fault at MP 10.4, and unnamed faults near MP 16.0 and MP 20.6. All of these faults have had historic displacement.

- Subsidence — The southern portion of the North Mainline would cross areas of subsidence associated with oil and gas development or groundwater withdrawal between MP 0 and MP 13 and between MP 22.4 and MP 69.5/78.1. Subsidence has also been identified along Loop 4 between MP 0 and MP 6, the Lindsay Segment between MP 0 and MP 2, and the Coalinga Segment between MP 4 and MP 47.4.

- Soil liquefaction, settlement, and hydrocompaction — Soil liquefaction and settlement occur where the proposed route crosses unconsolidated fine granular material such as young alluvium, which is the most common geological material crossed in the Central Valley (see table 4.1.1.1-1). Hydrocompaction could occur where unconsolidated Pleistocene alluvium has never been wetted; however, specific areas have not been identified. Loop 4 would cross young alluvium between MP 8.5 and MP 11.3.

4.1.2.3 Coast Ranges - San Francisco Bay Area

The geologic hazards that could be encountered along the proposed route through this province are:

- Seismic hazards — Seismic activity related to the San Andreas Fault system is pervasive throughout the province. This fault system is dominated by right-lateral, strike-slip faults that mark the intersection between the Pacific Ocean and the North American continent. In Central California, the primary fault zones within this system are the San Andreas, Hayward, Calaveras, Marsh Creek-Greenville, and Concord-Green Valley (DMG, 1992). Numerous secondary right-slip faults are also present, and localized regional stress may result in active faults with different orientations and fault mechanisms. Thus, within the regionally pervasive right-lateral shearing, there are secondary left-slip, oblique, and reverse faults that are active or potentially active and that could cause seismic shaking and fault rupture hazards. The North Mainline would cross the active Greenville and Concord Fault Zones; the Palo Alto Segment would cross the Las Positas and Verona Faults and the Calaveras and Hayward Fault Zones; if Alternative Customer Group 1 were to be served, the Oakland Segment would cross the Calaveras and Hayward Faults; the Fremont Segment would cross the Hayward Fault Zone; and the Antioch Segment would cross the Antioch Fault (see table 4.1.1.1-1).

- Landslides — The combination of moderate to steep terrain and landslide-prone geologic units within this province creates numerous areas of slope instability crossed by the proposed route (see table 4.1.1.1-1). The landslide-prone geologic units are typically Cretaceous-Tertiary sedimentary rocks. These units would be crossed primarily by the North Mainline through the Diablo Range between MP 235.7/244.4 and MP 276.6/285.4.

- Soil liquefaction, settlement, and hydrocompaction — Soil liquefaction and settlement occur in areas susceptible to ground shaking and underlain by loose granular material as well as in areas where there is a high water table. Within the province, areas underlain by young alluvium or intertidal bay mud deposits may be susceptible to liquefaction (see table 4.1.1.1-1). Segments that would cross Bay Mud include the Fremont, Palo Alto, Hunters Point, and San Francisco Segments. No areas of potential hydrocompaction would be crossed by the proposed pipeline in the Coast Ranges-San Francisco Bay Area.

- Subsidence — No areas of subsidence have been identified that would be crossed by the proposed route through the Coast Ranges-San Francisco Bay Area.

4.1.3 Mineral Resources

Mineral resources include metals, minerals, and nonmetals such as oil and gas as well as sand and gravel. No significant metal or mineral resources are crossed by the proposed route. Nonmetal resources along the route consist of bituminous coal from MP 1.1 to MP 2.1 on the North Mainline, oil and gas fields near Famoso on the North Mainline, in the Lodi Gas Field 4,000 feet west of the Sacramento Mainline between MP 34.2 and MP 36.2, shale and salt within 1 mile of the Fremont Segment, and specialty sand along the North Mainline from MP 267.8/276.5 to MP 268.4/277.1.

Natural gas, oil, and geothermal wells in or directly adjacent to the proposed right-of-way include one active oil well in Tulare County east of the Lindsay Alternative at MP 25, one idle oil well in Kern County east of the Lindsay Alternative at MP 3.5, and 28 plugged or abandoned wells scattered along the North Mainline. Sand and gravel resources are abundant along the route through the Central Valley and Coast Ranges-San Francisco Bay Area. No mineral resources have been identified along the proposed pipeline loops in the Mojave Desert.

4.1.4 Paleontologic Resources

Significant fossil deposits occur in the three physiographic provinces crossed by the proposed route. The Antiquities Act of 1906 and the Federal Land Policy Management Act of 1976 mandate the protection of significant paleontological resources on federally owned or controlled lands. CEQA also requires the protection of paleontologic resources in the state. While many geological formations have the potential to contain fossils, those containing vertebrate fossils tend to be most significant and hence most susceptible to construction impact. Vertebrate fossils tend to be rare and fragmentary (portions of skeletons) and thus have greater scientific importance whereas invertebrate and plant fossils are more common and thus less important.

Most of the proposed route crosses sedimentary rock formations composed of recent unconsolidated sediments, which are mostly potentially fossiliferous, but the expected number, type, and significance of the fossils vary widely along the route. Paleontologic resources within the proposed right-of-way include known fossil occurrences and deposits, known fossil-bearing strata, and strata with the potential to produce fossil deposits.

Mojave conducted a Phase I survey of the proposed route. The resulting survey reports include detailed, referenced descriptions of paleontologic resources encountered and the geologic formations in which they occur (Firby, 1993; Firby and Schorn, 1994). A Phase I survey consists of searching existing records and literature to determine the relative likelihood of encountering significant fossil deposits in a defined area. Table 4.1.4-1 at the end of section 4.1 lists the fossiliferous deposits or potentially fossiliferous geologic units identified in or near the proposed construction right-of-way. The table is based on the Phase I survey reports plus a review of published literature and archival searches at paleontological museums. The paleontological sensitivity of the geological units encountered along the proposed route has been classified as high, moderate, or low. High-sensitivity units are known or very likely to contain fossils of high scientific value. Moderate-sensitivity units are known to contain fossils but are unlikely to contain fossils of high scientific value. Low-sensitivity units contain few fossils or fossils of little value. All areas along the proposed route that are not included in the table are of moderate paleontologic sensitivity.

TABLE 4.1.1.1-1

Geologic Hazards and Geologic Areas with Potential Significant Impact Along the Proposed Route

Physiographic Province & Pipeline Segment	Geologic Formation or Condition	Milepost a/	Issue
Mojave Desert			
Loop 1	Pleistocene-recent alluvium	0.0-10.6	Trench slope stability
	Tertiary volcanics; Paleozoic granitics	10.6 - 12	Potentially difficult excavation
		12 - 15.5	Trench slope stability
Loop 2	Pleistocene-recent Alluvium Pleistocene-recent alluvium; Tertiary volcanics; granitics	0.0 - 36.5	Potentially difficult excavation in Tertiary units; slope stability in areas of moderate to steep slopes; trench slope stability in alluvium
	Ludlow Fault	30.4	Quaternary
Loop 3	Recent alluvium; Pleistocene-recent alluvium; Pleistocene alluvium; Plio-Pleistocene alluvium; Cretaceous granite rocks	0.0 - 22.9	Potentially difficult excavation in Cretaceous unit; slope stability in areas of moderate to steep slopes; trench slope stability in alluvium; settlement in recent alluvium; liquefaction potential in loose alluvium
	South Lockhart Fault	15.5; 15.8; 16.9; 17.1; 17.5	Late Quaternary; maximum estimated displacement = 3.6 ft.
	Unnamed fault	21.4	Late Quaternary; short section
	Unnamed fault	21.5	Late Quaternary; short section
Central Valley			
Loop 4	White Wolf Fault	0.1	Holocene; 1952 displacement; maximum estimated displacement = 9.2 ft.
	Recent dune sand; Pleistocene-recent alluvium; Pleistocene alluvium; Plio-Pleistocene alluvium	0.0 - 25.0	Trench slope stability; settlement in recent alluvium; regional subsidence (MPs 0.0-6.0), liquefaction potential in loose alluvium (MPs 8.5-11.3; 24.6-25.0)
	Edison Fault	10.4	Possibly Quaternary; splay of White Wolf; maximum estimated displacement = 1.3 ft.
	Unnamed fault	14.5 - 16.5	Late Quaternary-Holocene; maximum estimated displacement = 0.9 ft.
	Race Track and Ant Hill Oil Fields	17.0 - 20.0	Oil resource

TABLE 4.1.1.1-1 (cont'd)

Physiographic Province & Pipeline Segment	Geologic Formation or Condition	Milepost a/	Issue
Loop 4 (cont'd)	Unnamed fault	20.6	Late Quaternary; fault projects toward alignment; maximum estimated displacement = 0.7 ft.
	Kern Bluff Oil Field	21.3 - 23.5	Oil resource
North Mainline	Hartman Fox Plant	0.1	Sand and gravel resource
	Kern River Oil Field	0 - 3.5	Oil resource
	Alluvium	0 - 12.9	Regional subsidence
	HOP Demonstration Unit No. 1	1.1 - 2.1	Bituminous rock resource
	New Hope Fault	2.5 - 8.0	Quaternary displacement; pipeline crosses
	Pond-Poso Creek Fault	8.0 - 10.2	Quaternary displacement; pipeline crosses
	Unnamed fault	14.8	Quaternary displacement; pipeline crosses projection
	Premier Fault	16.4	Historic displacement; pipeline crosses projection; maximum estimated displacement = 1.5 ft.
(Famoso Alternative)	Unnamed fault	17.8	Quarternary displacement; pipeline crosses
(Famoso Alternative)	Alluvium	22.5 - 69.5/78.1	Regional subsidence
	Alluvium	88.5/97.1 - 104.9/113.5	Liquefaction potential
	Kings Canyon lineament	151.7/160.3	Pre-Quaternary
	Alluvium	159.9/168.4 - 160.2/168.7	Settlement; liquefaction potential
	Alluvium	167.0/175.6 - 168.9/177.5	Settlement; liquefaction potential
	Alluvium	220.5/229.1 - 234.7/243.3	Settlement; liquefaction potential
	Tracy Pit	231.2/239.8 - 231.7/240.3	Stone resource
Sacramento Mainline	Alluvium	0 - 54	Settlement
	Stockton Fault	19.3	Pre-Quaternary; alignment crosses concealed fault
	Pit	52.2	Possible sand and gravel resources
	Pleistocene-Holocene alluvium; Pliocene alluvium	54.0 - 63.4	Trench slope stability; settlement in Holocene alluvium
Coalinga Segment	Alluvium	4 - 47.4	Subsidence
		25.3 - 31.5	Settlement; liquefaction potential

TABLE 4.1.1.1-1 (cont'd)

Physiographic Province & Pipeline Segment	Geologic Formation or Condition	Milepost a/	Issue
Lindsay Segment	Alluvium	0 - 2.0	Subsidence
	Alluvium	0 - 17.1	Settlement; liquefaction potential
Sanger Segment	Alluvium	0 - 11.2	Settlement, liquefaction potential
Livingston Segment	Alluvium	0 - 0.2	Trench slope stability
Ceres Segment	Alluvium	0 - 2.2	Trench slope stability
Modesto B Segment	Alluvium and Modesto Formation	0 - 4.7	Settlement, liquefaction potential
Tracy Segment	Alluvial fan deposits	0 - 5.8	Liquefaction potential
Tracy Segment (A-160)	Pleistocene-Holocene fan deposits	0 - 2.7	Trench slope stability; settlement in Holocene alluvium; liquefaction potential in loose alluvium
Tracy Segment (A-161)	Gravel pit	0	Sand and gravel resource
	Pleistocene-Holocene fan deposits	0 - 1.9	Trench slope stability; settlement in Holocene alluvium; liquefaction potential in loose alluvium
Kingsburg Segment	Alluvium/alluvial fan deposits	0 - 0.4	Liquefaction potential
Turlock A Segment	Alluvium	0 - 3.2	Trench slope stability
Lathrop Segment	Dune sand	8.2	Trench-slope stability
Lindsay Alternative	New Hope Fault	0.0	Holocene creep
	Plio-Pleistocene alluvium	0 - 10.4	Trench slope stability
	Unnamed fault	0 - 1.5	Early Quaternary; parallel fault
	Unnamed fault	1.5 - 10.5	Early Quaternary; parallel fault
	Holocene alluvium; Pleistocene - Holocene alluvium; Pleistocene alluvium; Pilo-Pleistocene alluvium	10.4 - 42.6	Trench slope stability; settlement in Holocene alluvium; liquefaction potential in loose alluvium
	Nanceville Pit	32.8	Gravel bar skimmer
Malaga Segment	Pleistocene recent alluvium	0 - 0.7	Trench slope stability; settlement in recent alluvium; liquefaction potential in loose alluvium
Madera Segment	Holocene alluvium; Pleistocene-recent alluvium	0 - 6.2	Trench slope stability; settlement in recent alluvium; liquefaction potential in loose alluvium

TABLE 4.1.1.1-1 (cont'd)

Physiographic Province & Pipeline Segment	Geologic Formation or Condition	Milepost a/	Issue
Coast Ranges - San Francisco Bay Area			
North Mainline	Vernalis Fault	225.1/233.8 - 225.6/234.3	Age of fault not well defined, possibly Quaternary (inferred location)
	Pereira Property	232.2/240.8 - 232.7/240.3	Sand and gravel resource
	Cretaceous-Tertiary marine and non-marine sedimentary rocks	234.7/243.3 - 243.0/251.6	Potentially difficult excavation; slope stability
	Midway Fault	238.4/247.0	Late Quaternary
	Unnamed Fault	239.5/248.0	Pre-Quaternary; projects to within 1,000 ft of alignment
	Elk Ravine Fault	241.5/250.2	Age of fault not well defined, probably Pre-Quaternary
	Patterson Pass Fault	243.2/251.9	Pre-Quaternary; near mapped terminus of fault
	Alluvium and Tertiary marine sediments	244.7/253.4 - 246.1/254.9	Potentially difficult excavation in Tertiary units; slope stability in areas of moderate to steep slopes; trench stability in alluvium; settlement; liquefaction potential
	Coral Hollow Fault	245.0/253.7	Late Quaternary queried fault projection
	Greenville Fault Zone	245.5/254.1 - 245.9/254.5 249.3/257.9 - 250.5/259.1	Historic displacements 1980 fault rupture; multiple fault strands; APSS zone; maximum estimated displacement = 10.1 ft
	Patterson Pass Road Pit	247.8/256.5	Sand and gravel resource
	Cretaceous-Tertiary sedimentary rocks	250.4/259.0 - 264.0/272.9	Potentially difficult excavation; slope stability
	Kellogg Fault	255.0/263.7	Quaternary; short strand
	Kellogg Fault	255.2/263.9	Quaternary; short strand
	Kellogg Fault	256.6/265.3	Quaternary; short strand
	Kellogg Fault	257.7/266.4 - 258.1/266.8	Quaternary; subparallel fault strain
	Brentwood Fault	258.7/267.4 - 260.2/268.9	Quaternary; Multiple short strands
	Antioch/Davis Fault	262.8/271.6 - 262.9/271.7	Late Quaternary; fault mapped 1000 ft west of alignment

TABLE 4.1.1.1-1 (cont'd)

Physiographic Province & Pipeline Segment	Geologic Formation or Condition	Milepost a/	Issue
North Mainline (cont'd)	Miocene-Pliocene nonmarine sediment and volcanic rock; Eocene, Oligocene, and Miocene, marine sedimentary rocks	263.9/272.6 - 277.1/285.9	Potentially difficult excavation; slope stability
	Pleistocene-Holocene alluvium; Eocene marine sediments	264.6/273.3 - 268.4/277.5	Potentially difficult excavation in Eocene units; slope stability in areas of moderate to steep slopes; trench slope stability in alluvium; settlement in Holocene alluvium; liquefaction potential in loose alluvium
	Alluvium	277.1/285.9	Settlement and liquefaction potential
	Clayton fault	281.8/290.6	Late Quaternary; fault end mapped 500 ft south of alignment
	Quaternary intertidal deposits and bay mud	285.2/294.1 - 288.9/297.9	Settlement and liquefaction potential
	Concord Fault Zone	286.9/295.8 - 287.7/296.6	Holocene (creep); two mapped fault strands; APSS zone; maximum estimated displacement = 2.8 ft
	Cretaceous marine sediments	288.2/297.8 - 291.1/299.9	Potentially difficult excavation
Palo Alto Segment	Las Positas Fault, north branch	0.9 - 1.0 2.4 - 2.6	Historic; maximum estimated displacement = 1.2 ft
	Las Positas Fault, south branch	1.9 - 2.3	Historic; 1980-81 creep; maximum estimated displacement = 1.2 ft
	Verona Fault	8.6 - 9.5	Historic; route would cross projected trace of fault; maximum estimated displacement = 0.8 ft
	Alluvium and Pliocene-Pleistocene nonmarine sedimentary rocks	12.0 - 14.0	Trench-slope stability; settlement; liquefaction potential
	Calaveras Fault Zone	12.7 - 12.9	Historic; multiple fault strands; possible APSS zone; maximum estimated displacement = 8.1 ft
	Sunol Pit	17.7	Sand and gravel resource

TABLE 4.1.1.1-1 (cont'd)

Physiographic Province & Pipeline Segment	Geologic Formation or Condition	Milepost a/	Issue
Palo Alto Segment (cont'd)	Miocene sediments; Cretaceous Great Valley Sequence	14.7 - 22.5	Potentially difficult excavation; slope stability in areas of modest to steep slopes
	Alluvium and Plio-Pleistocene nonmarine sediments	24.8 - 49.0	Trench slope stability; settlement; liquefaction potential
	Unnamed fault	18.4 - 18.8	Pre-Quaternary
	Unnamed fault	20.5 - 20.8	Pre-Quaternary; short quarried fault subparallel and intersection alignment
	Hayward Fault Zone	22.2 - 22.5	Historic; multiple fault strands possible; APSS zone; maximum estimated displacement = 11.9 ft
	Unnamed fault	31.7 - 32.8	Quaternary; concealed traces approximately located
	Unnamed fault	37.2 - 38.2	Quaternary; concealed traces approximately located
	Unnamed fault	49	Concealed trace approximately located near end of alignment
Antioch Segment	Pliocene Nonmarine sediments	0 - 0.9	Slope stability in areas of moderate to steep slopes
	Alluvium	2.0 - 4.4	Trench-slope stability; settlement; liquefaction potential
	Antioch Fault	4.4	Holocene creep within 1,000 ft; APSS zone
Fremont Segment	Intertidal deposits and alluvium	0 - 15.4	Trench-slope stability; settlement; liquefaction potential
	Silver Creek Fault	10.1	Quaternary; concealed trace 0.1 mile SW of alignment
	Hayward Fault Zone	14.3 - 14.6	Historic; active APSS zone; maximum estimated displacement = 11.9 ft
Oakland Segment	Pleistocene-Holocene alluvium	0.0 - 3.4	Trench slope stability; settlement in Holocene alluvium; liquefaction potential in loose alluvium
	Plio-Pleistocene gravels	3.4 - 5.1	Trench slope stability
	Pleistocene-Holocene alluvium	5.1 - 12.0	Trench slope stability; settlement in Holocene alluvium; liquefaction potential in loose alluvium
	Gravel Pit	5.4 - 5.6	Sand and gravel resource

TABLE 4.1.1.1-1 (cont'd)

Physiographic Province & Pipeline Segment	Geologic Formation or Condition	Milepost a/	Issue
Oakland Segment (cont'd)	Gravel Pit	6.0 - 6.3	Sand and gravel resource
	Calaveras Fault	11.4 - 11.6	Historic; multiple fault strands; APSS zone; maximum estimated displacement = 8.1 ft
	Pleistocene-Holocene alluvium; Miocene nonmarine and marine sediments; Cretaceous Great Valley Sequence	12.0 - 25.0	Potentially difficult excavation in Cretaceous and Miocene units; slope stability in areas of moderate to steep slopes; trench-slope stability in alluvium; settlement and liquefaction potential
	Hayward Fault	22.3 - 22.7	Historic; crosses multiple stands; 4APSS zone; maximum estimated displacement 11.9 ft
	Alluvium	25.0 - 31.7	Trench-slope stability; settlement; liquefaction potential
	East Chabot Fault	24.9 - 25.1	Crosses concealed fault; APSS zone
	West Chabot Fault	25.6 - 25.8	Crosses concealed fault; APSS zone
Antioch Segment (A-174)	Pleistocene-Holocene alluvium; Pleistocene alluvium	0 - 4.9	Trench slope stability; settlement in Holocene alluvium; liquefaction potential in loose alluvium
	Antioch Fault	2.4 - 2.8	Holocene creep; alignment crosses fault; APSS zone
Martinez Segment	Holocene intertidal deposits; Pleistocene-Holocene alluvium; Eocene marine section	0 - 1.0	Trench slope stability; settlement in Holocene alluvium; liquefaction potential in loose alluvium; potential difficult excavation in Eocene units
Hunters Point Segment	Unnamed fault	0 - 5	Quaternary; Subparallels pipeline route; unnamed concealed faults; distance varies from 0.5 to 1.0 miles from fault
	Recent fill; Pleistocene-Holocene alluvium; Pleistocene older alluvium; Pleistocene continental and marine sediments; Cretaceous Franciscan Complex	5.0 - 30	Trench slope stability; settlement in artificial fill and Holocene alluvium; liquefaction potential in loose alluvium; potentially difficult excavation in Cretaceous units
	Extension of San Bruno Fault	6 - 18.6	Quaternary; parallels queried fault
	San Bruno Fault	18.6 - 20.5	Quaternary; crosses, parallels, and subparallels concealed fault

TABLE 4.1.1.1-1 (cont'd)

Physiographic Province & Pipeline Segment	Geologic Formation or Condition	Milepost a/	Issue
Hunters Point Segment (cont'd)	Serra Fault	19 - 21	Pre-Quaternary; fault subparallels alignment approximately 1 mile west
	Hillside Point Fault	22.4	Pre-Quaternary; crosses mapped fault
	City College Fault	25.6	Pre-Quaternary; crosses concealed trace of fault
San Francisco Segment	Recent fill	0 - 1.5	Trench slope stability; settlement in artificial fill; liquefaction potential in artificial fill

---

a/ Where two milepost numbers are given separated by a slash, the first number is the milepost in the pipeline configuration to serve Alternative Customer Group 1 in addition to the Core Customer Group, and the second number is the milepost in the pipeline configuration to serve Alternative Customer Group 2 in addition to the Core Customer Group. Where only one milepost is given, the pipeline configuration would be the same in that area to serve both alternative customer groups. Where no number is given before or after the slash, the entry only applies to one configuration or the other.

APSS = Alquist-Priolo Special Studies; an APSS zone is an area of land around an active fault where building restrictions are imposed and seismic studies are conducted.

g = The force exerted by gravity on a resting body.

TABLE 4.1.4-1

Paleontologic Resources In or Near the Proposed Construction Right-of-Way

Pipeline Segment	Milepost Start	Milepost End	Geologic Formation	Paleontologic Sensitivity	Formation Milepost a/ Start	Formation Milepost a/ End	Documented Paleontologic Sites b/
Mojave Desert							
Loop 3	0.0	22.9	KJqm	None	18.4	20.9	
Loop 4	0.0	25.0	Qs	Low	11.3	11.4	
			QP	High	13.3 15.9 17.2	15.4 16.7 24.3	
			Qsc	Low	24.3	25.0	
Central Valley							
North Mainline	0.0	291.0/ 299.9	Qt	High	0.0	2.3	3 SBCM sites less than 0.5 mile from ROW (Reynolds, 1990, 1994)
			QP	High	2.3	4.6	4 SBCM sites in ROW; 28 additional SBCM sites; 3 UCMP sites less than 0.5 mile from ROW (Reynolds, 1990, 1994)
			QP	High	4.6	8.0	2 SBCM sites in ROW; 1 CIT and 6 additional SBCM sites less than 0.5 mile from ROW (Reynolds, 1990, 1994)
			Qsc	Low	10.3	10.7	
			QP	High	8.8 10.7	9.1 16.6	8 SBCM sites less than 0.5 mile from ROW (Reynolds, 1990, 1994)
			Qsc	Low	120.6/129.4	121.6/130.1	
			Qs	Low	126.6/135.2 137.9/146.5 139.3/147.8 140.3/138.9 147.6/156.2 168.9/177.5	126.7/135.3 140.0/146.6 139.8/148.3 140.5/149.1 147.8/156.4 187.0/195.7	
			Qsc	Low	202.6/211.3 215.0/233.7 222.0/230.6	203.0/211.7 215.4/224.1 222.3/230.9	
			Qc	High	222.3/230.9 233.0/241.6	226.3/235.0 236.4/245.2	5 UCMP sites 1-2 miles from ROW (Firby and Schorn, 1994; Spencer *et al.*, 1992); about 20 UCMP sites 4-6 miles from ROW (Spencer *et al.*, 1992)

TABLE 4.1.4-1 (cont'd)

Pipeline Segment	Milepost		Geologic Formation	Paleontologic Sensitivity	Formation Milepost a/		Documented Paleontologic Sites b/
	Start	End			Start	End	
North Mainline (cont'd)			Mu	High	239.0/247.6 243.6/252.1	241.0/249.6 246.2/254.9	UCMP sites in ROW vicinity (Savage, 1955); UCMP and additional sites in ROW vicinity (Dibblee, 1980a; Savage, 1955)
			Qal	High	248.9/257.5	250.3/259.1	4 UCMP sites less than 0.5 mile from ROW (Firby and Schorn, 1994)
			Pmlc/Mu	High	270.0/278.8	273.6/282.4	3 UCMP sites 1.5-2 miles from ROW (Firby and Schorn, 1994); sites in ROW vicinity (Firby and Schorn, 1994)
			Tt	High	276.0/284.8	276.6/285.4	2 UCMP sites less than 1 mile from ROW; additional UCMP site near ROW (Firby and Schorn, 1994)
Sacramento Mainline	0.0	63.4	Qa	Low	24.0 32.0 38.8 52.0	24.2 32.4 39.0 52.8	
Coast Ranges/San Francisco Bay Area							
Palo Alto Segment	0.0	49.0	Qal	High	0.0	5.0	5 UCMP sites less than 2.5 miles from ROW; additional sites in ROW vicinity (Dibblee, 1980c; Firby and Schorn, 1994; Rogers, 1966)
			Qt/QP	High	5.0	7.9	13 UCMP sites in ROW vicinity (Firby and Schorn 1994); sites in ROW vicinity (Rogers, 1966)
			Mu	High	7.9 11.4 17.9 22.1	9.5 12.8 21.4 23.3	Sites in vicinity of ROW (Dibblee, 1980); 10 sites less than 2 miles from ROW (Dibblee, 1970, 1972)
			QP	High	23.3	23.5	UCMP site less than 0.5 mile from ROW; 2 USGS sites 2.5 miles from ROW (Firby and Schorn, 1994; Lander, 1988a) UCMP site less than 0.5 mile from ROW
Oakland Segment	0.0	31.7	Mu	High	5.4 6.7 8.2	5.7 8.1 212.7	4 UCMP sites less than 0.5 mile from ROW (Dibblee, 1980b; Firby and Schorn, 1994)
Hunters Point Segment	00	30.1	KJf	None	9.0 23.4	9.7 24.4	

TABLE 4.1.4-1 (cont'd)

Pipeline Segment	Milepost		Geologic Formation	Paleontologic Sensitivity	Formation Milepost a/		Documented Paleontologic Sites b/
	Start	End			Start	End	
Antioch Segment	0.0	4.4	Pmlc	High	0.0	0.2	3 UCMP sites near ROW (Firby and Schorn, 1994)
			Psv	None	2.7 3.1	2.8 3.4	
Lindsay Alternative	0.0	42.6	QP	High	0.0	1.5	
			Qal	Low	19.1	27.7	

a/ Where two milepost numbers are given separated by a slash, the first number is the milepost in the pipeline configuration to serve Alternative Customer Group 1 in addition to the Core Customer Group, and the second number is the milepost in the pipeline configuration to serve Alternative Customer Group 2 in addition to the Core Customer Group. Where only one milepost number is given, the pipeline configuration would be the same in that area to serve both alternative customer groups. Where no number is given before or after the slash, the entry only applies to one configuration or the other.

b/ References are cited in Lander, 1994.

Qsc = Holocene =Stream channel deposits, alluvium, poorly sorted stream and basin deposits; clay to boulders
Qs = Holocene-Pleistocene =Dune sand, sand dunes
Qal/Qa = Holocene-Pleistocene =Alluvium, unconsolidated stream and basin deposits; clay to boulders
Qt = Holocene-Pleistocene =Terrace deposits; gravel, sand, silt, clay
Qc = Pleistocene =Nonmarine sediments
QP = Pliocene-Pleistocene =Nonmarine, older alluvial deposits
Pmlc = Pliocene =Continental deposits
Tt = Pliocene =Tehema Formation, nonmarine sandstones, siltstones, and volcaniclastics
Psv = Miocene-Pliocene =Sonoma Formation, volcanics
Mu = Miocene =Upper Miocene marine sediments
KJf = Cretaceous-Jurassic =Franciscan Formation
KJqm = Cretaceous-Jurassic =Intrusives (quartz monzonite)
High = High sensitivity resources would require full-time construction monitoring; formation contains comparatively high density of previously recorded fossil sites in ROW vicinity and is very likely to contain as yet unrecorded fossil sites in ROW.
Moderate = Moderate sensitivity resources are not listed in this table but would require spot checking during construction; formation contains relatively moderate density of previously recorded fossil sites in ROW vicinity and is somewhat likely to contain as yet unrecorded fossil sites in ROW.
Low = Resources with no to low sensitivity would require no construction monitoring; formation contains no or relatively low density of previously recorded fossil sites in ROW vicinity and is not likely to contain as yet unrecorded fossil sites in ROW.
CIT = California Institute of Technology.
SBCM = San Bernardino County Museum.
UCMP = University of California Museum of Paleontology.

Note: References are cited in Lander, 1994.

4.2 SOILS

4.2.1 General Soil Conditions

The Mojave Desert is dominated by broad alluvial basins filled with continental deposits from surrounding uplands that are progressively burying the old topography. Throughout the desert, small hills rise above the alluvial valley fill. Soil characteristics including texture and composition are variable but less so than in the Central Valley. Like most deserts, rainfall varies from about 2.5 to 6 inches annually.

In the Central Valley, parent materials consist of heterogeneous mixtures of clays, silts, sands, and gravels with local mudstones and sandstones. Lacustrine and marsh deposits occur in the San Joaquin Valley and consist of extensive lenses of clays and silts. River deposits, flood plain deposits, and sand dunes occur primarily along major rivers and streams and in other low-lying areas. The climate in the Central Valley ranges from semi-arid in the southern San Joaquin Valley to temperate in the Sacramento Valley. Mean annual rainfall ranges from 5 to 20 inches. The lands of the Central Valley are well-watered because its rivers are fed by the heavy rain and snowfall of the Sierra Nevada. During severe storms, the valley floor may flood locally and inundate thousands of acres of crops.

In the Coast Ranges, the terrain varies from steep hills to flat valleys. Parent materials consist of the primarily sedimentary Franciscan Assemblage and Great Valley sequence rocks, predominantly shales, sandstones, and local serpentine, metamorphosed basalt, limestone, and chert. The San Francisco Bay lowland is underlain primarily by organic-rich silt and clay, commonly referred to as bay mud. The climate in this province is generally temperate with some significant local variations in rainfall. The normal annual precipitation in the region ranges from 16 to 24 inches. Of particular note is the existence of rain shadows on many of the east sides of ridges.

4.2.2 Soil Groups

We categorized the soils along the proposed route into eight groups on the basis of the characteristics most relevant to pipeline construction and environmental restoration. Table 4.2.2-1 at the end of section 4.2 lists the soils with potential for significant impact along the proposed route by segment, milepost, and county. Table 4.2.2-2 identifies the number of miles of soil in each group. The soils in some areas may have more than one relevant characteristic, and, therefore, the mileages have been included in more than one soil group.

- Shallow soils where bedrock is close to the ground surface — The proposed route crosses about 172 miles of soils in this group. Shallow soils along the proposed route generally occur on steep slopes, alluvial fans, and flood plains and often support rangeland and shallow-rooted crops. The potential for blasting increases when constructing in areas of shallow soil.

- Hydric soils, i.e., soils with seasonally high water tables, soils that are frequently or occasionally flooded, and soils that are poorly drained — The proposed route crosses about 105 miles of soils in this group. These soils would be crossed primarily in low areas near San Francisco Bay and Suisun Bay (near Martinez and Pittsburg), in basins, and along stream corridors, rivers, and floodplains, particularly after it rains.

Table 4.2.2-2

Soil Groups Crossed by the Proposed Route

Physiographic Province and Pipeline Segment a/	Total Miles Crossed b/							
	Shallow Soil/ Bedrock	Wet/Poorly Drained	Low Fertility	Unstable Soil/ Steep Slopes	High to Severe Erosion/Runoff	Wind Erosion (Soil Blowing)	Hardpan Present	Saline/Sodic Soils
Mojave Desert								
Loops 1 and 2	52.2	0	52.2	52.2	52.2	52.2	0	52.2/0
Loop 3	0.6	0	22.9	0.6	0.6	12.4	9.9	12.0/12.0
Central Valley								
Loop 4	0.4	0	6.5	0	0.4	14.4	0	0/0
North Mainline (MP 0 - 236.0/244.6)	50.5	18.6	155.1	10.3	8.7	44.9	68.7	79.0/105.0
Sacramento Mainline	0	13.2	45.2	0	0	8.0	57.5	0/0
Lindsay Segment	0	0	3.4	0	0	0	5.1	1.7/2.7
Coalinga Segment	3.6	14.7	33.4	0	0	0	4.4	48.2/47.6
Kingsburg Segment	0	0	0.4	0	0	0	0	0.4/0.4
Sanger Segment	0	0	11.2	0	0	0	0	11.2/11.2
Livingston Segment	0	0	0	0	0	0.2	0	0/0
Turlock A Segment	0	2.9	0	0	0	0	0	0.3/3.2
Ceres Segment	0	0	2.2	0	0	2.2	0	0/2.2
Modesto B Segment	0	0	4.7	0	0	4.4	0	0/4.7
Tracy Segment	0	0	0	0	0	0	0	0/0
Lathrop Segment	0	0	8.2	0	0	8.2	8.2	0/0
Sacramento Alternative	0	0	8.5	0	0	0	9.4	0/0
Lindsay Alternative	0	0	17.6	0	0	0.7	18.5	5.4/4.7
Malaga Segment	0.1	0	0.1	0	0	0	0	0.1/0.1
Madera Segment	0	0	6.2	0	0	6.2	6.2	0/0
Fairmead Segment	5.0	0	5.0	0	0	0	5.0	0/0
Turlock Segment	0	2.5	2.5	0	0	2.5	0	0.9/3.4
Ripon Segment	0	0	2.0	0	0	2.0	2.0	0/0
Sacramento A-159 Segment	0	0	7.1	0	0	0	7.5	0/0
Tracy A-160 Segment	0	0	0	0	0	0	0	0/0
Tracy A-161 Segment	0	0	0	0	0	0	0	0/0

Table 4.2.2-2 (cont'd)

Physiographic Province and Pipeline Segment a/	Total Miles Crossed b/							
	Shallow Soil/ Bedrock	Wet/Poorly Drained	Low Fertility	Unstable Soil/ Steep Slopes	High to Severe Erosion/Runoff	Wind Erosion (Soil Blowing)	Hardpan Present	Saline/Sodic Soils
Coast Ranges - San Francisco Bay Area								
North Mainline (MP 236.0/244.6 to 291.0/299.9)	13.7	4.8	38.6	40.5	48.8	0	0	15.6/13.6
Palo Alto Segment	23.7	13.1	29.5	17.0	11.2	0	0	13.5/1.7
Oakland Segment	12.8	2.9	31.4	12.8	19.4	0	0	1.2/1.2
Antioch Segment	0	0	0	0	0	0	0	0/0
Fremont Segment	0	14.6	4.5	0	0	0	0	10.9/0
Altamont Alternative A	3.2	0	5.2	1.4	1.4	0	0	1.4/0
Antioch South Alternative	0	0	0.1	2.1	4.2	0	0	0/0
Antioch South/Clayton Alternative	0	0	2.2	2.2	2.2	0	0	0/0
Oakland Alternative	4.4	5.1	6.7	4.4	4.4	0	0	5.1/0
Antioch A-174 Segment	0	0	0.9	0	0	0	0	0/0
Martinez Segment	0	1.0	0	0	0	0	0	1.0/1.0
Hunters Point Segment	1.6	10.7	0	1.5	2.8	0	0	0/0
San Francisco Segment	0	1.1	0	0	0	0	0	0/0
TOTAL	171.8	105.2	513.5	145.0	156.3	158.3	202.4	260.1/214.7

---

a/ Where two milepost numbers are given separated by a slash, the first number is the milepost in the pipeline configuration to serve Alternative Customer Group 1 in addition to the Core Customer Group, and the second number is the milepost in the pipeline configuration to serve Alternative Customer Group 2 in addition to the Core Customer Group. Where only one milepost number is given, the pipeline configuration would be the same in that area to serve both alternative customer groups. Where no number is given before or after the slash, the entry only applies to one configuration or the other.

b/ The soils in some areas may have more than one relevant characteristic, and, therefore, the mileages have been included in more than one soil group.

- Soils with low inherent fertility, which occur where organic matter is lacking — The proposed route crosses about 514 miles of soils in this group. Soils in this group would be common in the Mojave Desert and along much of the route through the Central Valley.

- Unstable soils and soils on steep slopes, which tend to erode and are prone to slumping or landslides — The proposed route crosses 145 miles of soils that may be in this group. Clayey soils on slopes are typically unstable, especially during the rainy season, and are common in Deer Valley and the Briones Valley area (between MP 262/272 and MP 266/275), which would be crossed by the North Mainline, and in the Mojave Desert.

- Soils with high to severe erosion potential, which include soils on steep slopes, soils with rapid water runoff, soils associated with exposed rock, and sparsely vegetated, noncohesive soils easily transported by water — The proposed route crosses about 156 miles of soils that may be in this group. The removal of vegetation and other disturbances accelerate the erosion of these soils.

- Soils prone to wind erosion, which are generally dry, sandy soils with little vegetative cover — The proposed route crosses about 158 miles of soils that may be in this group. Soils prone to wind erosion are common in the Mojave Desert.

- Soils where hardpan is present — The proposed route crosses about 202 miles of soils that may be in this group. Hardpan is found primarily in the Central Valley, and some caliche is present in the western portion of the Mojave Desert. Topsoil may be limited where hardpan is present.

- Soils with high salinity or sodicity (sodium content), which develop in arid regions when soluble salts concentrate in the soils — Saline soils contain enough salts to adversely affect the growth of most crop plants. Sodic soils contain enough sodium to adversely affect the soil structure and growth of cultivated plants. The proposed route crosses about 260 miles of saline and 215 miles of sodic soils. Saline and sodic soils are found throughout the project area.

4.2.3 Soils at Proposed Compressor Stations

The characteristics of the soils at the compressor stations are summarized below.

- The proposed 20.6-acre Amboy Compressor Station would be on alluvial soils that are generally granite-derived gravels to cobbles and loamy sands to sandy loams. They are very deep, excessively drained, and not considered prime or unique farmland. Slopes range from 2 to 9 percent.

- The proposed 17-acre Daggett Compressor Station would be on granitic-derived alluvial soils that are gravelly sands to sandy loams, very deep, somewhat excessively drained, and not considered prime or unique farmland. Slopes range from 2 to 15 percent.

- The proposed 17.28-acre Lindsay Compressor Station would be on level to nearly level (less than 1 percent slope) land with loamy soils. They are moderately deep, moderately well-drained soils on alluvial fan piedmonts and are considered prime or unique farmland.

- The proposed 20-acre Famoso Compressor Station would be on alluvial soils that are mainly granitic-derived sandy loams. They are deep, well drained, and considered prime or unique farmland. Slopes range from 0 to 5 percent.

- The site of the existing Topock Compressor Station, which would be modified, is fully paved so no native soils would be affected.

TABLE 4.2.2-1

Soils With Potential for Significant Impact Along the Proposed Route

Pipeline Segment and Mileposts a/	Soil Series of Concern	Surface Soil/Subsoil	Sensitive Characteristics
NORTH MAINLINE			
Northeast Kern County (SCS, 1967) b/			
1.2-8.0 8.7-9.1 9.3-9.4 9.9-10.7 11.3-13.1	Kettleman	Loam/Loam	Steep slopes (15-50%)
Northwest Kern County (Famoso Alternative/McFarland Segment) (SCS, 1988)			
16.4-22.0	Lewkalb	Sandy loam/Loam, sandy loam, loamy sand	Low inherent fertility; saline and sodic soils.
22.0-26.1 30.0-31.4 33.3-36.3	Kimberlina	Sandy loam/Sandy loam, silt loam	Low inherent fertility; saline and sodic soils
32.1-33.3	Garces	Silt loam/Clay loam, loam	Low inherent fertility; saline and sodic soils
	Panoche	Clay loam/Clay loam	Low inherent fertility; saline and sodic soils
Western Tulare County (Famoso Alternatives) (SCS, Unpublished)			
38.2-38.8 39.8-40.9 55.8-56.5 56.7-57.7 58.0-58.8 60.1-61.1 62.7-64.4 64.9-67.8 74.0/82.5-74.3/82.8 74.8/83.3-75.1/83.6	Colpien	Loam, clay loam/Clay loam, loam	Sodic soils
43.4-43.6	Garces	Silt loam/Clay loam, silty clay loam, loam, sandy clay loam	Low inherent fertility; saline soils
43.6-43.7 46.4-46.5 52.7-52.8 53.1-53.2 87.1/95.7-87.9/96.5	Tujunga	Loamy sand/Loamy sand	Low inherent fertility; high wind erosion hazard; saline soils
55.1-55.8 56.5-56.7 57.7-58.0	Biggriz	Loam/Loam, sandy clay loam	Sodic soils
58.8-59.6 78.6/87.1-78.8/87.3 80.8/89.3-81.6/90.1	Fresno	Loam/Sandy clay loam, clay loam	Low inherent fertility; saline soils
78.2/86.7-78.3/86.8 78.8/87.3-79.1/87.6 80.4/88.9-80.8/89.3 81.6/90.2-82.6/91.2	Remnoy	Sandy loam, loam/Clay loam	Shallow soils; low inherent fertility; saline and sodic soils
82.6/91.2-83.2/91.8	Youd	Sandy loam/Cemented hardpan	Low inherent fertility; saline soils
Eastern Fresno Area (SCS, 1971)			
89.8/98.6-109.0/117.6 112.8/121.3-113.5/122.0	Hesperia	Sandy loam/Silt	Low inherent fertility; saline and sodic soils
120.7/129.3-121.6/130.2	Hesperia	Hesperia	Low inherent fertility; saline and sodic soils

TABLE 4.2.2-1 (cont'd)

Pipeline Segment and Mileposts a/	Soil Series of Concern	Surface Soil/Subsoil	Sensitive Characteristics
Madera Area (SCS, 1962)			
121.6/130.2-123.5/132.0 125.9/134.5-133.6/142.2	Tujunga	Loamy sand/Loamy sand, sand	High erosion hazard; low inherent fertility
146.6/155.2-147.1/155.7 147.8/156.4-151.3/159.9	Pachappa	Sandy loam/Loam sandy loam, loamy sand	Saline soils
	Grangeville	Sandy loam/Sandy loam, loamy sand, loam	Saline soils
Merced Area (SCS, 1991b)			
153.9/162.5-154.4/163.0 154.6/163.2-159.2/167.7 160.3/168.8-163.4/171.9	Lewis	Silt loam/Silty clay loam	Saline and sodic soils
154.4/163.0-154.6/163.2	Fresno	Loam/Clay loam, sandy clay loam	Low to moderate inherent fertility; saline and sodic soils
	Traver	Sandy loam/Sandy loam, loam	Saline and sodic soils
168.8/177.4-181.9/190.6	Delhi	Sand/Sand, silt	High wind erosion hazard
182.4/191.1-186.0/194.7	Atwater	Sand/Loam, sandy clay loam	High wind erosion hazard; saline and sodic soils
181.9/190.6-182.4/191.1	Hanford	Sandy loam/Sandy loam, sand, clay	Saline and sodic soils
186.0/194.7-188.5/197.2	Hillmar	Loamy sand/Silt loam, sandy loam, sand	Saline and sodic soils
	Delhi	Sand/Sand, silt	High wind erosion hazard
	Dello	Sand, loamy sand	Saline and sodic soils
Eastern Stanislaus Area (SCS, 1964)			
188.5/197.2-193/201.7	Hilmar	Loamy sand, sand/Loamy sand, sand	Low inherent fertility; sodic soils
193.0/201.7-193.6/202.3	Delhi	Loamy sand, sand/Loamy sand, sand	High wind erosion hazard; low to moderate inherent fertility
193.6/202.3-197.0/205.7	Dinuba	Sandy loam/Sandy loam	Saline and sodic soils
197.0/205.7-205.8/214.5 206.6/215.4-211.2/219.9 214.2/222.9-215.0/223.7	Tujunga	Loamy sand, sand/Loamy sand, sand	High wind erosion hazard; low to very low inherent fertility; sodic soils
205.8/214.5-206.6/215.4	Tujunga	Loamy sand/Loamy sand, sand	Low inherent fertility; sodic soils
216.2/219.9-219.2/222.9	Modesto	Loam, clay loam/Clay, sandy clay	Low to moderate inherent fertility; sodic soils
	Chualar	Sandy loam/Clay loam	Sodic soils
San Joaquin County (SCS, Unpublished)			
215.0/223.7-221.9/230.5	Delhi	Coarse/Coarse	High wind erosion hazard
	Veritas	Coarse/Coarse	High wind erosion hazard; low inherent fertility
	Tinnin	Coarse/Coarse	High wind erosion hazard; low inherent fertility
223.2/231.9-224.7/233.4	Willows	Fine/Fine	Low inherent fertility; saline and sodic soils
	Pescadero	Moderately fine/Fine to moderately fine	Low to moderate inherent fertility; saline and sodic soils

TABLE 4.2.2-1 (cont'd)

Pipeline Segment and Mileposts a/	Soil Series of Concern	Surface Soil/Subsoil	Sensitive Characteristics
San Joaquin County (cont'd)			
236.0/244.7-239.0/247.7	Calla	Moderately fine/Moderately fine	Steep slopes (8-50%); moderate to high erosion hazard; low to moderate inherent fertility
	Carbona	Moderately fine/Moderately fine to fine	Steep slopes (8-50%); moderate to high erosion hazard; low to moderate inherent fertility
	Wisflat	Moderately coarse/Moderately coarse	Steep slopes (30-75%); shallow to very shallow soils; high to very high erosion hazard; low inherent fertility
Alameda Area (SCS, 1966)			
239.0/247.7-239.7/248.4 240.0/248.7-246.3/255.0 250.5/259.1-253.4/262.0	Altamont	Clay/Clay	Steep slopes (3-75%); slight to very high erosion hazard; saline and sodic soils
	Diablo	Clay/Silty clay	Steep slopes (7-60%); slight to very high erosion hazard; saline and sodic soils
Contra Costa County (SCS, 1977a)			
253.4/262.0-278.5/287.4	Altamont	Clay/Clay, silty clay	Steep slopes (9-75%); slight to high erosion hazard
	Diablo	Clay/Clay, silty clay	Steep slopes (9-50%); slight to high erosion hazard
	Fontana	Silty clay loam/Silty clay loam	Steep slopes (9-75%); slight to high erosion hazard; low to moderate inherent fertility
	Rincon	Clay loam/Clay	None to high erosion hazard
278.5/287.4-285.2/294.1	Tierra	Loam, clay loam/Clay, silty clay loam	Shallow soils; moderate to high erosion hazard
285.2/294.1-285.6/294.5 285.7/294.6-286.8/295.7 287.0/295.9-287.6/296.5	Clear Lake	Clay/Clay	Saline soils
285.6/294.5-285.7/294.6	Joice	Muck/Muck	Saline and sodic soils
286.8/295.7-287.0/295.9	Reyes	Silty clay/Silty clay	Saline and sodic soils
287.6/296.5-288.4/297.3	Sacramento	Clay/Clay	Saline and sodic soils
	Omni	Clay loam/Clay	Saline soils
288.4/297.3-291.0/299.9	Los Osos	Clay loam/Clay	Steep slopes (15-75%); shallow to moderately deep soils; moderate to high erosion hazard; low to moderate inherent fertility
	Millsholm	Loam/Loam	Steep slopes (15-75%); shallow to moderately deep soils; moderate to very high erosion hazard; low inherent fertility
	Los Gatos	Loam/Clay loam	Steep slopes (15-75%); shallow to moderately deep soils; moderate to high erosion hazard; low to moderate inherent fertility

TABLE 4.2.2-1 (cont'd)

Pipeline Segment and Mileposts a/	Soil Series of Concern	Surface Soil/Subsoil	Sensitive Characteristics
SACRAMENTO MAINLINE			
San Joaquin County (SCS, Unpublished)			
0-8.3	Delhi	Coarse/Coarse	High wind erosion hazard
	Veritas	Coarse/Coarse	High wind erosion hazard; low inherent fertility
	Tinnin	Coarse/Coarse	High wind erosion hazard; low inherent fertility
LINDSAY SEGMENT			
Western Tulare County (SCS, Unpublished)			
0-1.0	Colpien	Loam, clay loam/Clay loam, loam	Sodic soils
9.8-11.5	Lewis	Silty clay loam/Clay loam, sandy loam	Saline and sodic soils
	Quonal	Silty clay, Silty clay, clay	Saline and sodic soils
COALINGA SEGMENT			
Western Tulare County (SCS, Unpublished)			
2.3-3.1	Fresno	Loam/Loam	Low inherent fertility; saline soils
3.1-3.3	Colpien	Loam, clay loam/Clay loam, loam	Sodic soils
Kings County (SCS, 1986a)			
3.3-3.7 7.3-12.1	Kimberlina	Sandy loam to 60+ inches	Low inherent fertility; saline and sodic soils
19.4-20.5	Garces	Loam/Clay loam, sandy clay loam	Low inherent fertility; saline and sodic soils
3.7-7.3	Remnoy	Sandy loam/Clay loam	Shallow soils; low inherent fertility; saline and sodic soils
	Melga	Loam, silt loam/Silty clay loam, clay loam	Low inherent fertility; saline and sodic soils
	Youd	Sandy loam/Hardpan	Shallow soils; low inherent fertility; saline and sodic soils
12.1-19.4	Nord	Sandy loam/Sandy loam	Saline and sodic soils
20.5-31.1	Armona	Loam/Sand, clay loam	Saline and sodic soils
	Lakeside	Loam, sandy loam/Loam, clay loam	Saline and sodic soils
	Grangeville	Sandy loam, loam/Sandy loam	Saline and sodic soils
Fresno County (SCS, Unpublished)			
31.1-33.3	Lethent	Clay loam/Clay, clay loam	Low inherent fertility; saline and sodic soils
33.3-48.2	Panoche	Loam, clay loam to 60+ inches	Low inherent fertility; saline and sodic soils
	Westhaven	Loam/Silt loam, silty clay loam, silty clay	Low inherent fertility; saline and sodic soils
37.5-39.3	—	Ponded sediment behind California Aqueduct	Asbestos-containing sediment
49.5-52.5	Panoche	Loam to 60+ inches	Low inherent fertility; saline and sodic soils
KINGSBURG SEGMENT (To Serve Alternative Customer Group 1)			
Eastern Fresno Area (SCS, 1971)			
0-0.4	Hesperia	Sandy loam/Silt	Low inherent fertility; saline and sodic soils

TABLE 4.2.2-1 (cont'd)

Pipeline Segment and Mileposts a/	Soil Series of Concern	Surface Soil/Subsoil	Sensitive Characteristics
SANGER SEGMENT			
Eastern Fresno Area (SCS, 1971)			
0-11.2	Hesperia	Sandy loam/Silt	Low inherent fertility; saline and sodic soils
LIVINGSTON SEGMENT			
Merced Area (SCS, 1991b)			
0-0.2	Delhi	Sand/Sand, Silt	High wind erosion hazard
	Atwater	Sand/Loam, sandy clay loam	High wind erosion hazard
TURLOCK A SEGMENT (To Serve Alternative Customer Group 1)			
Eastern Stanislaus Area (SCS, 1964)			
0-0.8 1.1-3.2	Hilmar	Loamy sand, sand/Loamy sand, sand	Sodic soils
0.8-1.1	Dinuba	Sandy loam/Sandy loam	Saline and sodic soils
CERES SEGMENT			
Eastern Stanislaus Area (SCS, 1964)			
0-2.2	Tujunga	Loamy sand, sand/Loamy sand, sand	High wind erosion hazard; low to very low inherent fertility; sodic soils
MODESTO B SEGMENT			
Eastern Stanislaus Area (SCS 1964)			
0-0.3	Tujunga	Loamy sand/Loamy sand, sand	Low inherent fertility; sodic soils
0.3-4.7	Tujunga	Loamy sand, sand/Loamy sand, sand	High wind erosion hazard; low to very low inherent fertility; sodic soils
PALO ALTO SEGMENT			
Alameda Area (SCS, 1966)			
1.0-1.4	Altamont	Clay/Clay	Steep slopes (3-75%); slight to very high erosion hazard
	Diablo	Clay/Silty clay	Steep slopes (7-60%); slight to very high erosion hazard; saline soils
5.5-7.0 7.8-13.5	Positas	Loam/Clay loam	Steep slopes (2-60%); shallow to moderately deep soils; slight to very high erosion hazard; low inherent fertility
	Perkins	Loam/Clay loam	Steep slopes (3-75%); slight to very high erosion hazard; low inherent fertility
14.6-21.0	Millsholm	Silt loam/Silt loam	Steep slopes (30-75%); shallow soils; high to very high erosion hazard; low inherent fertility
	Los Gatos	Loam/Loam	Steep slopes (30-75%); high to very high erosion hazard; low to moderate inherent fertility
	Los Osos	Silty clay loam/Silty clay loam	Steep slopes (3-75%); high to very high erosion hazard; low to moderate inherent fertility

TABLE 4.2.2-1 (cont'd)

Pipeline Segment and Mileposts a/	Soil Series of Concern	Surface Soil/Subsoil	Sensitive Characteristics
Santa Clara County (SCS, 1968)			
21.0-21.1	Los Gatos	Loam/Clay loam	Steep slopes (30-75%); shallow to moderately deep soils; moderate to very high erosion hazard
	Gaviota	Loam/Loam	Steep slopes (5-75%); shallow to moderate deep soils; moderate to very high erosion hazard; low to very low inherent fertility
	Vallecitos	Loam/Clay loam, clay	Steep slopes (15-75%); shallow to moderately deep soils; moderate to very high erosion hazard
21.1-22.2	Soper	Loam/Clay loam	Moderate to high erosion hazard; low inherent fertility
22.2-23.0	Altamont	Clay/clay	Steep slopes (15-75%); shallow to moderately deep soils; moderate to very high erosion hazard
	Azule	Clay loam, silty clay loam/Sandy clay	Steep slopes (9-75%); very shallow to deep soils; moderate to very high erosion hazard
Alameda County (SCS, 1981a)			
23.0-25.2	Millsholm	Silt loam/Silt loam	Steep slopes (30-75%); shallow soils; high to very high erosion hazard; low inherent fertility
	Los Gatos	Loam/Loam	Steep slopes (30-75%); high to very high erosion hazard; low to moderate inherent fertility
	Los Osos	Silty clay loam/Silty clay loam	Steep slopes (3-75%); high to very high erosion hazard; low to moderate inherent fertility
Santa Clara County (SCS 1968)			
26.3-28.5 28.7-29.0 30.7-36.5 44.2-47.1	Clear Lake	Clay/Clay	Saline soils
29.0-30.7	Orestimba	Clay loam, silty clay loam/Clay loam	Low to moderate inherent fertility; saline and sodic soils
	Willows	Clay/Clay	Low inherent fertility; saline and sodic soils
47.1-49.0	Pleasanton	Loam/Clay loam	None to high erosion hazard
OAKLAND SEGMENT (To Serve Alternative Customer Group 1)			
Alameda County (SCS, 1966)			
0-4.6	Yolo	Loam/Sandy loam	Nearly level to sloping; low to moderate inherent fertility
5.8-6.8	Pleasanton	Loam/Clay loam	Nearly level to sloping; moderate inherent fertility

TABLE 4.2.2-1 (cont'd)

Pipeline Segment and Mileposts a/	Soil Series of Concern	Surface Soil/Subsoil	Sensitive Characteristics
Alameda County (cont'd)			
4.6-5.8 11.9-12.3	Positas	Loam/Clay loam	Steep slopes (2-60%); shallow to moderately deep soils; slight to very high erosion hazard; low inherent fertility
	Perkins	Loam/Clay loam	Steep slopes (3-75%); slight to very high erosion hazard; low inherent fertility
6.8-11.9	Clear Lake	Clay/Clay	Saline soils
12.3-19.7	Millsholm	Silt loam/Silt loam	Steep slopes (30-75%); shallow soils; high to very high erosion hazard; low inherent fertility
19.7-20.4	Los Gatos	Loam/Loam	Steep slopes (30-75%); high to very high erosion hazard; low to moderate inherent fertility
	Los Osos	Silty clay loam/Silty clay loam	Steep slopes (3-75%); high to very high erosion hazard; low to moderate inherent fertility
	Xerothents	Silt loam/Silt loam	Steep slopes (30-75%); shallow soils; high erosion hazard; low inherent fertility
	Maymen	Loam/Shale bedrock	Steep slopes (30-75%); shallow soils; high to very high erosion hazard; low inherent fertility
	Millsholm	Silt loam/Silt loam	Steep slopes (30-75%); shallow soils; high to very high erosion hazard; low inherent fertility
22.7-28.7 29.9-31.7	Tierra	Loam/Loam, clay	Slight to high erosion hazard; low inherent fertility
28.7-29.9	Reyes	Clay/Clay, silty clay	Low inherent fertility; saline and sodic soils
FREMONT SEGMENT			
Alameda County (SCS, 1981a)			
0-10.9	Omni	Silty clay loam/silty clay	Saline soils
LATHROP SEGMENT (To Serve Alternative Customer Group 1)			
San Joaquin County (SCS, Unpublished)			
0-8.2	Delhi	Coarse/Coarse	High wind erosion hazard
	Veritas	Coarse/Coarse	High wind erosion hazard; low inherent fertility
	Tinnin	Coarse/Coarse	High wind erosion hazard; low inherent fertility

TABLE 4.2.2-1 (cont'd)

Pipeline Segment and Mileposts a/	Soil Series of Concern	Surface Soil/Subsoil	Sensitive Characteristics
LOOPS 1 AND 2 (MOJAVE MAINLINE)			
East Mojave Desert Area			
0.0-52.2	Bousic	Clay	High erosion hazard; low inherent fertility; saline soils
	Unnamed (playas)	Variable	Low inherent fertility; saline soils
	Halloran	Sand, sandy loam	High wind erosion hazard; low inherent fertility
	Rosamond	Loam, clay loam	High wind erosion hazard; saline soils
	Villa	Loamy sand	High wind erosion hazard; low inherent fertility
	Victorville	Sandy loam	High wind erosion hazard
	Cajon	Loamy sand	High wind erosion hazard; low inherent fertility
	Manet	Sand, loamy sand	High wind erosion hazard; low inherent fertility
	Garlock	Loamy sand	High wind erosion hazard; low inherent fertility
	Lithic/ torriorthents	Sandy loam (sand depth to hard fractured granite ranges from 1-18 inches)	Steep slopes (15-50%); very shallow to shallow soils; high erosion hazard; low inherent fertility
	Sparkhule	Sandy loam/Sandy clay loam	Steep slopes (15-50%); shallow soils; low inherent fertility
LOOP 3 (MOJAVE/KERN RIVER COMMONLINE)			
San Bernardino County - Mojave River Area (SCS, 1986b)			
0.0-0.4	Villa	Loamy sand to 60+ inches	Moderate to high wind erosion hazard; low inherent fertility
	Riverwash	Unstable sandy and gravelly alluvium	High wind erosion hazard; low inherent fertility
	Victorville	Sandy loam, loamy sand, clay loam	High wind erosion hazard
0.4-4.2 4.8-13.0	Halloran	Sand/Sandy loam	High wind erosion hazard; low inherent fertility
	Cajon	Loamy sand, sand/Sandy loam, clay loam	High wind erosion hazard; low inherent fertility; saline and sodic soils
4.2-4.8	Rock outcrop	Exposed igneous, metamorphic, or sedimentary rock with little or no soil material	Steep slopes (15-50%)
	Lithic/ torriothents	Sandy loam, sand (depth to hard fractured granite ranges from 1-18 inches)	Steep slopes (15-50%); very shallow to shallow soils; high erosion hazard; low inherent fertility
	Sparkhule	Sandy loam/Sandy clay loam	Steep slopes (15-50%); very shallow to shallow soils; low to moderate inherent fertility
13.0-22.9	Mojave	Sandy loam/Sandy clay loam	Low inherent fertility
	Adelanto	Sandy loam/Sandy loam	Low inherent fertility

TABLE 4.2.2-1 (cont'd)

Pipeline Segment and Mileposts a/	Soil Series of Concern	Surface Soil/Subsoil	Sensitive Characteristics
LOOP 4 (EAST SIDE LATERAL)			
Northwest Kern County (SCS, 1967)			
1.7-4.5 6.6-6.9 8.5-11.3	Cajon	Sand/Sand	High wind erosion hazard; low inherent fertility
6.9-8.5 11.5-12.8 18.1-23.7	Adelanto	Loamy sand/Sandy clay loam	Moderate to high wind erosion hazard
11.3-11.5	Calhi	Loamy sand/Loamy sand	High erosion hazard; low inherent fertility
24.2-24.6	Carrizo	Sandy loam/Loamy sand	Very shallow soils; high erosion hazard; low inherent fertility
0-1.4	Altamont	Clay/Clay	Steep slopes (3-75%); slight to very high erosion hazard
	Diablo	Clay/Silty clay	Steep slopes (7-60%); slight to very high erosion hazard; saline soils
LINDSAY ALTERNATIVE (To Serve Alternative Customer Group 2)			
13.3-13.4 17.5-18.0	Delvar	Clay loam/Clay, sandy loam	Low inherent fertility; saline and sodic soils
13.4-13.6 13.8-16.4 16.6-17.5 18.7-18.9 19.5-19.6 22.7-22.8	Centerville	Clay/Clay, clay loam	Saline and sodic soils
27.8-28.2 31.3-31.4 32.1-32.2 34.3-34.4	Tujunga	Loamy sand/Loamy sand	High wind erosion hazard; low inherent fertility; saline soils
MALAGA SEGMENT (To Serve Alternative Customer Group 2)			
0-0.1	Hesperia	Sandy loam/Silt	Shallow to moderately deep soils; low inherent fertility; saline to sodic soils
TURLOCK SEGMENT (To Serve Alternative Customer Group 2)			
0-2.5	Hilmar	Loamy sand, sand/Loamy sand, sand	Low inherent fertility; sodic soils
	Delhi	Loamy sand, sand/Loamy sand, sand	High wind erosion hazard; low to moderate inherent fertility.
2.5-3.4	Dinuba	Sandy loam/Sandy loam	Saline and sodic soils
RIPON SEGMENT (To Serve Alternative Customer Group 2)			
0-2.0	Delhi	Coarse/Coarse	High wind erosion hazard
	Veritas	Coarse/Coarse	High wind erosion hazard; low inherent fertility
	Tinnin	Coarse/Coarse	High wind erosion hazard; low inherent fertility
MARTINEZ SEGMENT (To Serve Alternative Customer Group 2)			
0-1.0	Sacramento	Clay/Clay	Saline and sodic soils
	Omni	Clay loam/Clay	Saline soils

TABLE 4.2.2-1 (cont'd)

Pipeline Segment and Mileposts a/	Soil Series of Concern	Surface Soil/Subsoil	Sensitive Characteristics
HUNTERS POINT SEGMENT (To Serve Alternative Customer Group 2)			
Santa Clara County (SCS, 1968)			
0-1.3	Pleasanton	Loam/Clay loam	None to high erosion hazard
26.9-27.4	Orthents	Varies in depth and texture depending on the amount and type of material used. These soils have been cut and filled for urban development.	Steep slopes (15-75%); very shallow to very deep soils; high to very high erosion hazard
27.4-27.8 28.9-29.5	Urban land	Area covered by asphalt, concrete, buildings, and other structures. The soils covered by these structures are similar to Orthents.	Steep slopes (5-75%)
	Orthents	Varies in depth and texture depending on the amount and type of fill material used. These soils have been cut and filled for homesite and urban development.	Steep slopes (5-75%); variable depths; moderate to very high erosion hazard

---

a/ Where two milepost numbers are given separated by a slash, the first number is the milepost in the pipeline configuration to serve Alternative Customer Group 1 in addition to the Core Customer Group, and the second number is the milepost in the pipeline configuration to serve Alternative Customer Group 2 in addition to the Core Customer Group. Where only one milepost number is given, the pipeline configuration would be the same in that area to serve both alternative customer groups. Where no number is given before or after the slash, the entry only applies to one configuration or the other.

b/ References are cited in WCC, 1994.

4.3 WATER RESOURCES

The proposed Mojave Northward Expansion Project would cross five hydrologic basins. To simplify the discussions of groundwater and surface water, these resources have been addressed in the three physiographic provinces — the Mojave Desert, Central Valley, and Coast Ranges-San Francisco Bay Area.

4.3.1 Groundwater

Table 4.3.1-1 lists the areas of shallow groundwater, i.e., less than 20 feet below ground surface (bgs), along the proposed route. Table 4.3.1-2 lists the public supply wells within 200 feet of the route, and Table 4.3.1-3 summarizes the groundwater quality problems along the route.

4.3.1.1 Mojave Desert

Groundwater in the Mojave Desert has been developed for domestic, agricultural, and industrial (mining) uses. Severe overdraft has occurred in many of the desert basins. Because of the arid climate, shallow aquifers do not exist along this portion of the pipeline. Alluvial aquifers may be present in the immediate vicinity of dry lake basins; otherwise, most wells in the desert penetrate fractured bedrock 300 to 1,200+ feet bgs. No springs or artesian wells would be crossed by the proposed pipeline loops. Beneficial uses designated for the Mojave Desert groundwater basins include municipal and domestic, agricultural, industrial, and fresh water replenishment for inland lakes and streams. Municipal and industrial wastewater discharges near the city of Barstow have created a downstream "plume" of poor-quality groundwater near the proposed Daggett Compressor Station, which has deteriorated the otherwise good-quality groundwater used for local domestic supplies. The Harper Valley Subbasin crossed by Loop 3 is a relatively deep aquifer; water quality in some areas of the basin is reported to be poor for irrigation and domestic use.

4.3.1.2 Central Valley

The proposed route through the San Joaquin Valley traverses the Tulare and San Joaquin Valley Groundwater Basins whose boundaries parallel those of the Tulare Lake and San Joaquin River Surface Water Basins. The groundwater basins are divided into subbasins based largely on political considerations and groundwater management requirements. Many beneficial uses have been designated for the groundwater basins and subbasins traversed by the pipeline. Almost all of the subbasins are designated for municipal, domestic, agricultural, and industrial service uses, and many are also designated for use in industrial processing.

Tulare Groundwater Basin

The Tulare Groundwater Basin is filled with as much as 3,000 feet or more of unconsolidated continental sediments of Pliocene or Pleistocene age. High total dissolved solids (TDS) and sulfates are characteristic of groundwater quality in aquifers in the basin. Wells screened in the upper layers of this aquifer yield water with excessive levels of arsenic, boron, cadmium, chloride, iron, manganese, mercury, nitrate, selenium, and sulfate. The banned pesticide dibromochloropropane (DBCP) has been found in groundwater in the basin, especially in the Fresno area where wells have been shut down. The area of highest DBCP concentration closest to the proposed route is near Kingsburg. DBCP has also been found in groundwater near Livingston. The EPA has designated

TABLE 4.3.1-1

Areas of Shallow Groundwater Along the Proposed Route (Less Than 20 Feet Below Ground Surface)

Pipeline Segment	Mileposts a/	Groundwater Basin/Subbasin	Depth to Groundwater (ft)	Beneficial Uses b/	Quality Issues c/
North Mainline	155.7-157.7/164.5-166.5	San Joaquin Valley/Merced	5-10	MAPI	
	157.7-172/166.5-180.6	San Joaquin Valley/Merced	0-5	MAPI	
	172-174/180.6-182.6	San Joaquin Valley/Merced	5-10	MAPI	
	174-175/182.6-183.6	San Joaquin Valley/Merced	0-5	MAPI	
	175-180.1/183.6-188.8	San Joaquin Valley/Merced	5-10	MAPI	
	189.3-190.9/178.2-199.5	San Joaquin Valley/Turlock	0-5	MAPI	HC
	217.7-237.8/226.3-246.4	Sacramento-San Joaquin Delta/Tracy	0-10	MAI	
Coalinga Segment	25.3-31.5	San Joaquin Valley/Westside	<20	MAI	TDS
Tracy Segment	All	Sacramento-San Joaquin Delta/Tracy	5-10	MAI	HC, VOC, BNA, Metals
Palo Alto Segment	24.4	Santa Clara Valley/Fremont	7-11	MAPI	HC
	30.2-49	Santa Clara Valley/Santa Clara	6-10	MAPI	SW, HC, VOC
Oakland Segment	18.2-31.7	Alameda Bay Plain	1-20	MAPI	
Turlock Segment	0.0-3.4	San Joaquin Valley/Turlock	0-5	MAPI	
Ripon Segment	0-2.0	Sacramento-San Joaquin Delta/Modesto	5-10	MAPI	
Hunters Point Segment	5.0-30.1	San Francisco Bay	2-175	MAPI	HC, VOC
San Francisco Segment	0.0-1.5	Santa Clara Valley	<20	MAPI	HC, VOC d/

---

a/ Where two milepost numbers are given separated by a slash, the first number is the milepost in the pipeline configuration to serve Alternative Customer Group 1 in addition to the Core Customer Group, and the second number is the milepost in the pipeline configuration to serve Alternative Customer Group 2 in addition to the Core Customer Group. Where only one milepost number is given, the pipeline configuration would be the same in that area to serve both alternative customer groups. Where no number is given before or after the slash, the entry only applies to one configuration or the other.

b/ Beneficial uses have been identified for the groundwater basin, but the shallow groundwater may not be supported for these uses: M = municipal supply; A = agricultural; P = industrial processing; I = industrial service.

c/ Water quality issues may affect the permit requirements for the disposal of water removed during trench dewatering; TDS = high total dissolved solids; NO_3 = high nitrates; HC = hydrocarbons; VOC = volatile organic compound contamination; BNA = base/neutral acid extractable compounds; SW = saltwater intrusion; Source: Kleinfelder (1994).

d/ The San Francisco Segment was not addressed in Kleinfelder (1994), but depth and contamination were assumed because of conditions along nearby Hunters Point segment.

TABLE 4.3.1-2

Public Supply Wells Within 0.04 Mile of the Proposed Route

Segment and Milepost a/	Well Number b/	County c/	Approx. Distance to Alignment (miles)
North Mainline			
67.0/–	20S/24E-3H1	Tulare	0.04
75.8/83.7	18S/24E-19P1	Tulare	0.04
97.3/105.9	15S/21E-36B3	Fresno	0.04
101.1/109.7	15S/21E-15E1	Fresno	0.03
110.2/118.8	14S/20E-10M1	Fresno	0.03
112.9/121.4	13S/20E-32L2	Fresno	0.03
112.9/121.4	13S/20E-32L1	Fresno	0.03
114.8/123.3	13S/20E-30D1	Fresno	0.04
123.4/131.9	12S/18E-25G1	Madera	0.02
177.9/186.5	06S/12E-32G1	Merced	0.04
180.3/189.0	06S/11E-25F1	Merced	0.04
190.3/198.9	05S/10E-23G1	Stanislaus	0.04
190.3/198.9	05S/10E-23G2	Stanislaus	0.04
190.8/199.4	05S/10E-23C4	Stanislaus	0.03
190.9/199.5	05S/10E-23C3	Stanislaus	0.03
190.9/199.5	05S/10E-23C2	Stanislaus	0.03
191.3/200.0	05S/10E-15J2	Stanislaus	0.04
191.6/200.3	05S/10E-15G2	Stanislaus	0.03
192.8/201.5	05S/10E-9J2	Stanislaus	0.04
196.6/205.3	04S/10E-30P1	Stanislaus	0.04
199.5/208.2	04S/09E-14L2	Stanislaus	0.04
200.2/208.9	04S/09E-15A2	Stanislaus	0.03
200.2/208.9	04S/09E-15A1	Stanislaus	0.03
200.5/209.2	04S/09E-10Q1	Stanislaus	0.03
200.9/209.6	04S/09E-10L3	Stanislaus	0.03
206.6/215.4	03S/09E-19E2	Stanislaus	0.03
206.6/215.4	03S/09E-19E1	Stanislaus	0.03
211.1/219.8	03S/08E-3D1	Stanislaus	0.04
278.4/287.3	02N/01W-12Q1	Contra Costa	0.03
Coalinga Segment			
0.5	18S/23E-24B1	Kings	0.04
11.3	18S/22E-29N3	Kings	0.03
13.5	18S/21E-35H2	Kings	0.03
Tracy Segment			
5.7	02S/05E-22D1	San Joaquin	0.03
Oakland Segment			
7.4	03S/1E-08H2	Alameda	0.04
Lindsay Alternative			
38.6	23S/27E-17R1	Tulare	0.04
Hunters Point Segment			
3.5	05S/3W-33K5	San Mateo	0.02

---

a/ Segments and alternative routes not listed here have no public supply wells within 0.04 mile of the pipeline route on the basis of Office of Drinking Water data.

b/ The state well numbering system uses township, range, section, and a sequence number.

c/ The major drinking water purveyors by county are:
Tulare County - California Water Service
Kings County - City of Hanford
Fresno County - City of Fresno, California Water Service
Madera County - City of Madera
Merced County - City of Merced
San Joaquin - Cities of Tracy, Lathrop, and Lodi
Alameda County - Alameda County Water Agency
Contra Costa - Contra Costa Water Company
San Mateo - City of San Mateo
San Francisco - City of San Francisco

TABLE 4.3.1-3

Summary of Groundwater Quality Along the Proposed Route by Groundwater Basin

Segment and Mileposts a/	Groundwater Basin	Water Quality Problems
North Mainline		
0-121.8/0-130.4	Tulare Basin	High TDS and sulfates; HCs and VOCs near Fresno; high levels of As, B, Cd, Cl, Fe, Na, Mn, Hg, NO_3, Se, and SO_4 detected; high nitrates near Lindsay and Delano; wells closed due to DBCP in Fresno; overdrafting.
80.4-121.8/88.9-130.4	Madera Subbasin	Overdrafting
121.8-235.3/130.4-243.9	San Joaquin Valley Groundwater Basin	500 square miles in intermediate condition and 100 square miles in impaired condition out of 8,500-square-mile aquifer surface area; salinity and nitrate increases; fungicide and pesticide contamination; HCs and industrial solvents; Cr and sulfate contamination; overdrafting.
146.9-156.5/155.5-165.2	Chowchilla Subbasin	Overdrafting
Sacramento Mainline		
7.0-39.1	East San Joaquin County Subbasin	Wells near Lodi and Manteca have high levels of DBCP; overdrafting.
Coalinga Segment		
20.5, 25.4-52.5	Westside Subbasin	Brackish and saline waters of poor quality; TDS levels up to 5,000 ppm; HC contamination near Lemoore.
Tracy Segment		
All	Sacramento-San Joaquin Delta	Some industrial contamination with VOCs, BNAs, metals, and HCs.
Palo Alto Segment		
24.3-49.0	Santa Clara Valley Basin	Elevated levels of Fe, Hg, TCE, and other solvents; overdraft contributing to saltwater intrusion; 6% in impaired condition due to fuel leaks and VOC contamination; industrial solvent contamination; eastern portion has high levels of B and Mg.
7.4-12.2	Livermore Valley	Nitrate problem; basin in intermediate condition due to fuel leaks and VOC contamination.
Fremont Segment		
0-15.6	Niles Cone Valley	Saltwater intrusion; 20% of basin in impaired condition due to fuel leaks and VOC contamination.
Loop 3		
0-23.8	Harper Valley	High TDS; natural high salinity; overdrafting.
Oakland Segment		
18.2-31.7	Alameda Bay Plain Basin	Poor quality; not presently used for drinking water supplies. Possible HC contamination.
Hunters Point Segment		
5.0-30.0	San Francisco Bay	Numerous industrial sites with HC or VOC contamination.

TABLE 4.3.1-3 (cont'd)

Segment and Mileposts a/	Groundwater Basin	Water Quality Problems
San Francisco Segment		
0-1.5	Santa Clara Valley	Numerous industrial sites with HC on VOC contamination.

---

a/ Where two milepost numbers are given separated by a slash, the first number is the milepost in the pipeline configuration to serve Alternative Customer Group 1 in addition to the Core Customer Group, and the second number is the milepost in the pipeline configuration to serve Alternative Customer Group 2 in addition to the Core Customer Group. Where only one milepost number is given, the pipeline configuration would be the same in that area to serve both alternative customer groups. Where no number is given before or after the slash, the entry only applies to one configuration or the other.

DBCP = Dibromochloropropane.
TCE = Trichloroethylene.
TDS = Total dissolved solids.
VOC = Volatile organic compounds.
HC = Hydrocarbons
Sources: Kleinfelder (1994) and WWC (1994a).

the aquifer beneath Fresno County as a "sole-source aquifer" under the Safe Drinking Water Act, which affords it special protection under Federal law.

Nitrates are elevated in the Lindsay-Strathmore area and near Delano. Nitrate levels exceeding the state drinking water standards occur in groundwater in the basin, and domestic supply wells have been closed in several locations because of nitrates. Groundwater overdrafting and subsequent land subsidence has occurred in the basin although not in the vicinity of the proposed route. The Coalinga Segment is in the Tulare Groundwater Basin. It begins in the Kaweah Subbasin and crosses the Tulare Lake and Westside Subbasins. Water quality in the unconfined aquifers in the Westside Subbasin is poor with TDS at up to 5,000 parts per million (ppm). Groundwater may be present less than 20 feet bgs at an area near the Kings River (MP 25.3) for about 6 miles west.

San Joaquin Valley Groundwater Basin

The San Joaquin Valley Groundwater Basin, north of the Tulare Groundwater Basin, is a continuation of the sediment-filled San Joaquin Valley. In general, the deepest sediments are of marine origin and contain highly saline waters. For the most part, they contain freshwater; locally, however, they may contain brackish and saline water of poor quality. The continental deposits are largely of river origin with the discontinuity and heterogeneity associated with this type of deposition; however, there are significant laterally continuous and homogeneous deposits of lake origin. A bed of lake-deposited diatomaceous clay underlies the western and central portions of the valley. This deposit, known as the Corcoran clay, formed an effective barrier to the vertical movement of water that has been penetrated by many man-made conduits.

The Eastern San Joaquin County Subbasin has been identified as being subject to critical conditions of overdraft, causing receding water levels and land subsidence. Water quality problems in the basin are caused largely by dissolved salts and nutrients in agricultural return flows and by seepages from municipal and industrial percolation ponds. TDS and nitrate concentrations are high, and, since 1980, over 200 municipal supply wells have been closed in the San Joaquin Valley because of nitrate levels exceeding the state's drinking water standard. DBCP has also been identified in groundwater in the vicinity of Lodi and Manteca.

4.3.1.3 Coast Ranges - San Francisco Bay Area

Numerous groundwater basins and subbasins within the San Francisco Bay Hydrologic Area are traversed by the proposed route.

The Livermore Valley Basin is a structural basin developed in a syncline with an axis trending nearly east-west. The floor of the valley is covered by alluvial, lake, and swamp deposits of upper Pleistocene and Recent age. These deposits consist of gravel, sand, and clay up to 500 feet thick. Pumping for irrigation constitutes the major portion of the total withdrawal, but groundwater also supplies nearly all of the domestic, urban, and industrial requirements in Livermore Valley.

The Ygnacio Valley subbasin occupies a structural depression between the Berkeley Hills and the Mount Diablo Range in Contra Costa County. The valley is underlain by thick deposits of recent and older alluvium, which cover faulted and folded complexes of consolidated rocks. All of the available groundwater occurs in the alluvium, which may be 200 feet deep. Saltwater intrusion is increasing the salinity in the northern portion of the basin.

The Palo Alto segment traverses the Livermore Valley and Santa Clara Valley Basins. The Santa Clara Valley Water District uses water from the Santa Clara County Subbasin for drinking water. Other extractions are used for agriculture in the southern part of the basin. An unconfined layer of poor-quality water overlies a confined aquifer used for drinking water. Historical overdrafting has resulted in saltwater intrusion in the lower aquifer. The eastern portion of the basin has groundwater of poor quality with high local concentrations of boron and magnesium. The Santa Clara Valley Basin is also contaminated by industrial solvents such as trichloroethylene (TCE).

U.S. Geological Survey (USGS) data indicate that groundwater as shallow as 4 feet bgs exists below portions of the proposed route near Vallecitos and Alameda Creeks along the Palo Alto Segment. Groundwater about 10 feet bgs has been reported near the lower end of San Francisco Bay from about MP 24.9 to MP 45.0.

The Fremont Segment traverses the Niles Cone Groundwater Basin, where two or more separate aquifers exist. Each consists of a series of permeable gravel beds, which are generally irregular and lenticular, and some sands. The upper aquifers have been degraded by overdrafting and saltwater intrusion to such an extent that most of the current water supply is obtained from the lower aquifer 200 to 600 feet bgs. The City of Fremont uses the Niles Cone groundwater for drinking water and is at present recharging the aquifers with imported water to mitigate the effects of the saltwater intrusion.

The Oakland Segment crosses the Alameda Bay Plain Basin. As in the Niles Cone Groundwater Basin, two or more separate aquifers exist, each consisting of a series of permeable gravel beds and some sands. Water from the Alameda Bay Plain Basin is of poor quality and not currently used for municipal water supplies.

Shallow groundwater exists near San Lorenzo Creek along the Oakland Segment from MP 18.2 to MP 31.7. The depth to groundwater in this area has been reported to be as shallow as 10 feet bgs.

4.3.2 Surface Water

Table 4.3.2-1 at the end of section 4.3 lists the surface waters crossed by the proposed route as well as information on channel width, proposed construction method, whether they are perennial or intermittent, and whether fisheries or sensitive habitats are present. Table 4.3.2-2 summarizes the surface water quality problems along the route. This table is based on water quality assessments published by the CSWRCB, which ranks surface waters on the basis of how well they meet the goals of the basin's beneficial uses as outlined in the basin plans (CSWRCB, 1990). Smaller streams are not addressed by the state water quality assessments. The rankings are:

- Good — Waters support and enhance the designated beneficial uses.
- Intermediate — Waters generally support beneficial uses with an occasional degradation of water quality.
- Impaired — Water cannot reasonably be expected to attain or maintain applicable water quality standards because: (1) designated uses are not supported; (2) water quality impairment is moderate to severe; (3) designated use is compromised or limited; (4) the aquatic community is known to contain toxic substances in hazardous concentrations; (5) the aquatic community is not fully supported; (6) frequent fish

TABLE 4.3.2-2

Summary of Surface Water Quality Problems Along the Proposed Route

Segment and Mileposts	Drainage Name a/	Water Quality Problems b/
North Mainline		
44.9/42.5 c/	Deer Creek	100% in intermediate condition due to NPS pollution; fisheries habitat degradation.
88.5/97.1	Kings River	Elevated levels of Hg and DDT in fish (1980); 33% of lower river in impaired condition due to elevated fish tissue levels and TDS objective violations.
129.2/137.8	Cottonwood Creek	100% in impaired condition due to NPS pollution; fisheries habitat degradation, gravel mining, and agricultural wastewater problems.
133.3/141.9	Fresno River	100% in intermediate condition due to NPS pollution; fisheries habitat degradation.
182.2/190.8	Merced River	Toxaphene, Dieldrin, and Chlordane concentrations exceeding guidelines; 67% in impaired condition from NPS pollution leading to elevated fish tissue levels and toxic bioassay results; elevated levels of TDS due to agricultural return flows.
203.3/212.0	Tuolumne River	Elevated levels of nutrients conducive to algal growth; seasonal low values of DO; lower river in impaired condition due to NPS pollution causing elevated fish tissue levels and toxic bioassay results.
215.1/223.5	Stanislaus River	Presence of asbestos fibers; elevated levels of nutrients, DDT, PCBs, and Chlordane (1981); river in impaired condition due to NPS pollution causing elevated fish tissue levels and toxic bioassay results.
222.1/230.6	San Joaquin River	DDT, Chlordane, and Toxaphene concentrations exceeding guidelines; Water Quality Limited Segment by RWQCB due to elevated TDS and low DO levels; elevated N, As, and P levels; 30% in impaired condition due to NPS pollution leading to elevated fish tissue levels and toxic bioassay results.
Sacramento Mainline		
8.1	Lone Tree Creek	100% in impaired condition due to NPS from dairies leading to fish population decline.
16.5	Mormon Slough	100% in impaired condition due to NPS pollution; health advisory for Hg.
32.0	Mokelumne River	Water Quality Limited Segment by RWQCB due to high Cu and Zn; elevated levels of Cd, Hg, Cu, Zn, and Pb; DDT and PCBs detected in 1970s and 1980; lower river in impaired condition from NPS pollution and mine drainage leading to fish kills and habitat degradation.
Palo Alto Segment		
13.6	Alameda Creek	100% in impaired condition due to fisheries habitat degradation; threat of recreational impacts due to wastewater discharges in creek.
28.3	Coyote Creek	Elevated levels of Cr; 57% in intermediate condition.
32.4	Guadalupe River	100% in impaired condition with fish population decline and elevated fish tissue levels of unspecified contaminants.

---

a/ Water quality issues were identified by drainage basin and may not reflect conditions at the location of the pipeline crossing.

b/ Water quality assessments published by the CSWRCB (1990); elevated levels are measured concentrations but do not violate regulatory agencies' water quality objectives or maximum contaminant levels. Rankings are as follows:

Good = Waters support and enhance the designated beneficial uses;

Intermediate = Waters generally support beneficial uses with an occasional degradation of water quality;

Impaired = Waterbodies cannot reasonably be expected to attain or maintain applicable water quality standards based on: (1) designated uses are not supported; (2) water quality impairment is moderate to severe; (3) designated use is compromised or limited; (4) the aquatic community is known to contain toxic substances in hazardous concentrations; (5) the aquatic community is not fully supported; (6) frequent fish kills or tests show acute or chronic toxicity; or (7) a numerical measurement exceeds a specified objective.

c/ Milepost of Deer Creek crossing on Lindsay Alternative.

DDT = Dichlorodiphenyltrichloroethane.
NPS = Nonpoint source.
RWQCB = Regional Water Quality Control Board.
DO = Dissolved oxygen.
PCBs = Polychlorinated biphenyls.
TDS = Total dissolved solids.

kills or tests show acute or chronic toxicity; or (7) a numerical measurement exceeds a specified objective.

Beneficial uses were identified for all water crossings. The basin plans attribute municipal and domestic supply, agricultural supply, and contact recreation beneficial uses to most of the major streams crossed by the proposed route. For streams whose beneficial uses were not specifically identified in the basin plans, we attributed the beneficial uses of the receiving waters to the streams.

4.3.2.1 Mojave Desert

Loops 1, 2, and 3 traverse two major surface water basins in the Mojave Desert. Loops 1 and 2, adjacent to the Amboy Compressor Station, cross the Colorado River Basin's Bristol Lake Subbasin. Loop 3 crosses the South Lahontan Basin's Harper Valley Subbasin. Both subbasins are interior-draining dry lake basins. Surface water in these basins is mainly limited to streams originating in the higher mountains. In the lower elevations of the basins, the streams are dry washes for most of the year and only flow during and shortly after brief seasonal thunderstorms. Most washes in the upper Mojave Desert area are less than 5 feet wide with banks less than 6 inches high. Only about 15 percent of the washes are wider than 5 feet. Approximately 24 of these larger washes are crossed by the loops in the Mojave Desert. The existing compressor station at Topock, Arizona, is in the watershed for the Colorado River.

4.3.2.2 Central Valley

The proposed route through the San Joaquin Valley crosses the Tulare Lake and San Joaquin River Basins and a small portion of the Sacramento River Basin. The natural drainage patterns in the basins of the San Joaquin Valley have been modified by control structures, diversion structures, agricultural operations, irrigation facilities, and transportation right-of-way embankments. The diversion structures provide water for agriculture, which accounts for more than 95 percent of the valley's water use. There are no public drinking water supply intakes downstream from the proposed crossings.

Tulare Lake Basin

The Tulare Lake Basin is crossed by Loop 4, the southern portion of the North Mainline, and the Coalinga, Lindsay, Kingsburg, Sanger, McFarland, Malaga, and Livingston Segments. The basin is a closed depression with internal drainage to Buena Vista and Tulare Lakes except during exceptionally heavy runoff from the Sierra Nevada when flood flows in the Kings River reach the San Joaquin River as surface outflow through the Fresno Slough. These flood flows represent the only significant outflows from the basin. Surface water quality is generally characterized by high TDS, sulfates, and mineral and carbonate hardness. The Famoso Compressor Station at MP 19.7 on the North Mainline/Famoso Alternative is not in a 100-year floodplain based on Federal Emergency Management Agency (FEMA) maps. The North Mainline on both the Famoso and Lindsay Alternatives crosses the Kings River, the California Aqueduct, and on the Friant-Kern Canal. In addition to these, depending on the additional customer group that would be served, 55 or 81 intermittent streams and ditches and 23 or 24 canals would be crossed. The Tule and Kings Rivers are the only natural rivers in the Tulare Basin with sufficient flow to support fisheries, but fish also inhabit the Friant-Kern Canal and California Aqueduct.

San Joaquin River Basin

The San Joaquin River Basin is crossed by the North Mainline, a small portion of the Sacramento Mainline, and the Fairmead, Madera, Turlock and Turlock "A," Ceres, Modesto "B," Ripon, Tracy, and Lathrop Segments. The topography of the basin areas crossed is valley floor with flat tule lands. The San Joaquin River originates in the Sierra Nevada and flows west across the valley. Near the valley's western boundary the river turns and flows north to its outlet in the Sacramento-San Joaquin Delta at Suisun Bay. Irrigated agriculture accounts for most water use in the basin, and the San Joaquin River carries substantial amounts of agricultural return water or drainage. Agricultural drainage contributes salts, nutrients, pesticides, trace elements, sediments, and other byproducts that affect water quality. The route crosses the San Joaquin River twice in the basin, once as it enters the basin just north of Fresno and again before it exits the basin on the western edge of the valley near Tracy.

The North Mainline would cross most of the major tributaries to the San Joaquin River in this basin including the Fresno, Chowchilla, Merced, Tuolumne, and Stanislaus Rivers. The pipeline would cross six perennial rivers and 44 intermittent streams and ditches. None supports coldwater fisheries at the crossing locations because of the low elevation; however, the San Joaquin, Merced, Tuolumne, and Stanislaus Rivers support warmwater fisheries and sensitive riparian habitats near the crossings. The pipeline would also cross 18 canal and aqueduct networks carrying water to and from the basin including the California Aqueduct, Delta-Mendota Canal, Hetch-Hetchy Aqueduct, and the Main Canal.

The Sacramento Mainline and the Sacramento Segment for Alternative Customer Group 2 would cross the Sacramento-San Joaquin Delta Subbasin in the northern part of the San Joaquin River Basin. A small portion of the route would cross the Sacramento River Basin, which is addressed with the Delta Subbasin because they have similar characteristics in this area. The pipeline would cross 12 perennial and 13 intermittent rivers, streams, and ditches. The Sacramento Mainline would cross the Calaveras, Mokelumne, and Cosumnes Rivers, the Hetch-Hetchy and Mokelumne Aqueducts, and several other aqueducts and canals. The Hetch-Hetchy system on the Tuolumne River provides the water supply for the City of San Francisco. The Mokelumne Aqueduct supplies communities in the East Bay through a trans-delta pipeline.

There are no reservoirs near the proposed route in the Central Valley. Low flows resulting from upstream diversions and regulation have virtually eliminated salmon runs in the basin's streams. The part of the Mokelumne River from the Penn Mine to Highway 99 has been designated as a water quality limited segment by the RWQCB because of mine drainage containing elevated levels of copper and zinc. The Lathrop Meter Station would be in a 100-year floodplain in an area of commercial development.

4.3.2.3 Coast Ranges - San Francisco Bay Area

The North Mainline west of Tracy and the Antioch, Palo Alto, Oakland, Fremont, San Francisco, and Hunters Point Segments would cross the San Francisco Bay Basin including five perennial and 50 to 54 intermittent rivers and streams. The San Francisco Bay is an extensive and significant estuary that dominates the Pacific Coast. The water in the San Francisco Bay exhibits a wide range of salinities and temperatures depending on the influence from the ocean and freshwater streamflow. Streamflow in the San Francisco Bay Basin is highly seasonal with more than 90 percent of runoff occurring between November and April. Within the Coast Ranges, there are very few streams that support significant fisheries. Most streams crossed by the proposed route are dry at least half of the year. The Guadalupe River and Coyote, Alameda, Walnut, and Pacheco Creeks are the only perennial streams crossed by the route, and they support the anadromous steelhead, an important game fish. The quality of water in the streams and creeks varies. Alameda Creek discharges to the San Francisco Bay near Fremont and has been designated as a water quality limited segment by the RWQCB because of existing and long-range problems associated with wastewater discharges in its upper reaches. Guadalupe River and Arroyo de la Laguna are also impaired due to nonpoint source (NPS) pollution (table 4.3.2-1). The Santa Clara and Antioch Meter Stations and two block valves would be in 100-year flood plains. The North Mainline route lies adjacent to two reservoirs within the San Francisco Bay Area: Contra Loma Reservoir at MP 270.6/279.3 and Mallard Reservoir at MP 286/295. The Fremont Segment traverses the top of a cliff at the southern edge of groundwater recharge basins used by Alameda County Water District.

TABLE 4.3.2-1

Surface Waters Crossed by the Proposed Route

Segment and Milepost a/	Water Crossing	Channel Width b/	Construction Method c/	Status d/	Fishery e/	Sensitive Crossing f/
CORE PROJECT						
North Mainline						
Tulare Lake Basin						
10.4	Poso Creek	<100	Open	I		
12.3	Unnamed creek		Open	I		
13.8	Unnamed creek		Open	I		
14.8	Unnamed creek		Open	I		
15.4	Little Creek		Open	I		
19.2	Unnamed creek		Open	I		
23.0/23.4	Poso Creek (2 crossings)	<100	Open	I		
25.2	Friant Kern Canal		Bore	C	W	S
40.9	White River	<100	Open	I		
44.9	Deer Creek	<100	Open	I		
57.5	South Branch Tule River	<100	Open	I	W	R
58.6	North Branch Tule River	<100	Open	I		R
60.4	Elk Bayou	<100	Open	I		
62.9	Bates Slough	<100	Open	I		
63.5	Tulare Canal		Bore	I		
70.5/79.1	Packwood Creek	<100	Open	C		
71.9/80.4	Evans Ditch		Open	I		
73.9/82.4	Mill Creek	<100	Open	I		V
75.3/83.9	Mill Creek Ditch		Open			
80.7	Cross Creek (3 crossings)	<100	Open	I		R
81.5/90.0	Unnamed creek	<100	Open	I		
82.0/40.5	Unnamed creek		Open	I		
82.1/90.7	Unnamed ditch		Open	I		
83.1/91.7	Unnamed ditch		Open	I		
85.0/93.6	Traver Canal		Bore	C		
87.3/95.9	McClanahan Ditch		Open	I		
88.5/97.1	Kings River		Drill	P	W	S, R
89.1/97.9	Cole Slough Canal	250	Bore	C		R
91.7/100.5	Selma Ditch		Open	I		
95.0/103.8	Selma Branch, Kingsburg Canal		Open	C		
96.8/105.4	1881 Ditch		Open	I		
97.8/106.4	Fowler Switch Canal		Bore	C		
98.6/107.3	Iowa Ditch		Open	I		
100.3/108.9	Kirby Canal		Bore	C		
103.5/112.1	Briggs Canal		Bore	C		
104.9/113.5	Washington Colony Canal		Bore	C		
106.3/114.9	Central Canal		Bore	C		
111.9/120.5	Dry Creek Canal		Bore	C		
115.8/124.4	Victoria Canal		Bore	C		
118.4/127.0	Herndon Canal		Bore	C		

TABLE 4.3.2-1 (cont'd)

Segment and Milepost a/	Water Crossing	Channel Width b/	Construction Method c/	Status d/	Fishery e/	Sensitive Crossing f/
North Mainline, Tulare Lake Basin (cont'd)						
119.1/127.6	Humphrey Ditch		Open	I		
120.0/128.6	Unnamed creek	<100	Open	I		
San Joaquin River Basin						
121.7/130.2	San Joaquin River	100	Drill	P	W	S, R
123.7/132.2	Unnamed creek		Open	I		
123.9/132.5	Unnamed creek		Open	I		
125.8/134.3	Siphon and Canal		Bore	C		
129.2/137.8	Cottonwood Creek	<100	Open	I		S, R
133.3/141.9	Fresno River	200	Open	I		V, R
136.5/145.0	Schmidt Creek	<100	Open	I		V
138.0/146.6	Dry Creek	<100	Open	I		V
139.8/148.4	Berenda Creek	<100	Open	I		V
142.7/151.2	Unnamed creek		Open	I		
144.3/152.8	Califa Canal		Bore	C		
146.1/154.6	Unnamed creek		Open	I		
146.9/155.4	Berenda Slough	<100	Bore	I		R
149.0/157.5	Ash Creek	<100	Open	I		R
150.0/158.5	Unnamed creek		Open	I		
151.3/159.9	Chowchilla River	<100	Open	I		R
154.0/162.5	Dutchman Creek	<100	Open	I		
155.9/164.5	Unnamed creek		Open	I		
156.7/165.2	Deadman Creek	<100	Open	I		
157.9/167.3	Mariposa Creek (South Slough)	<100	Open	I		
159.8/168.3	Tetzlaff Lateral		Open	I		
160.1/168.7	Mariposa Creek (North Slough)	<100	Open	I		
161.0/169.5	Duck Slough	<100	Open	I		
162.0/170.5	Owens Creek	<100	Open	I		R
162.2/170.7	Miles Creek	<100	Open	I		R
163.1/171.7	Unnamed creek	<100	Open	I		
164.5/173.1	Unnamed creek		Open	I		
167.5/176.1	Bear Creek	<100	Open	I		R
168.5/177.2	Black Rascal Creek	<100	Bore	I		R
169.9/178.5	Trindade Drain		Bore	C		
170.5/179.1	Unnamed creek		Open	I		
171.3/179.9	Canal Creek		Bore	C		
174.9/183.5	Atwater Canal		Bore	C		
176.1/184.8	Unnamed creek		Open	I		
178.8/187.4	Arena Canal		Bore	C		

TABLE 4.3.2-1 (cont'd)

Segment and Milepost a/	Water Crossing	Channel Width b/	Construction Method c/	Status d/	Fishery e/	Sensitive Crossing f/
North Mainline, San Joaquin River Basin (cont'd)						
181.1/189.7	Unnamed creek		Open	I		
182.2/190.8	Merced River	100	Drill	P	W	S, R
183.7/192.3	Highline Canal		Bore	C		
186.4/195.1	Lateral No. 6		Bore	C		
188.2/196.8	Lateral No. 5		Bore	C		
195.0/203.7	Unnamed creek		Open	I		
198.6/207.2	Ceres Main Canal		Bore	C		
201.3/210.0	Unnamed creek		Open	I		
202.0/210.5	Lateral No. 1		Bore	C		
203.3/212.0	Tuolumne River	125	Drill	P	W	S, R
205.0/213.8	Lateral No. 4		Bore	C		
207.3/215.9	Lateral No. 3		Bore	C		
208.5/217.2	Hetch-Hetchy Aqueduct		Case	B		
209.1/217.3	Lateral No. 7		Bore	C		
210.6/219.2	Lateral No. 6		Bore	C		
215.1/223.5	Lateral No. 8		Bore	C		
215.6/224.1	Stanislaus River	150	Drill	P	W	S, R
218.7/227.3	Unnamed creek		Open	I		
219.3/228.0	Unnamed creek		Open	I		
221.7/230.4	Walthall Slough	100	.	I		
Sacramento-San Joaquin Delta Basin						
222.1/230.6	San Joaquin River	250	Drill	P	W	S, R
224.1/232.7	Unnamed Lateral		Bore	C		
226.3/235.0	Banta Carbona Lift Canal		Bore	C		
234.2/242.8	Delta Mendota Canal		Bridge	C	W	S
235.3/244.0	California Aqueduct		Bridge	C	W	S
236.0/244.6	Unnamed creek		Open	I		
San Francisco Bay Basin						
236.7/245.4	Unnamed creek		Open	I		
237.2/245.9	Unnamed creek		Open	I		
240.3/248.9	Patterson Creek	< 100	Open	I		
241.5/250.1	Unnamed creek		Open	I		
249.3/258.0	Altamont Creek	< 100	Open	I		
251.0/259.0	Unnamed creek		Open	I		
259.7/267.4	Kellogg Creek	< 100	Open	I		S
260.9/264.6	Marsh Creek	< 100	Open	I		
262.5/271.2	Briones Creek	< 100	Open	I		
263.4/272.1	Dry Creek	< 100	Open	I		
265.5/274.2	Deer Creek	< 100	Open	I		
268.4/277.1	Sand Creek	< 100	Open	I		
272.2/279.9	Unnamed creek		Open	I		
274.6/283.4	Kirker Creek	< 100	Open	I		
276.1/285.5	Contra Costa Canal		Bore	C	W	S

TABLE 4.3.2-1 (cont'd)

Segment and Milepost a/	Water Crossing	Channel Width b/	Construction Method c/	Status d/	Fishery e/	Sensitive Crossing f/
North Mainline, San Francisco Bay Basin (cont'd)						
277.3/286.1	Mokelumne Aqueduct		Bore	B		
278.5/287.3	Unnamed creek		Open	I		
279.1/287.8	Unnamed creek		Open	I		
280.4/289.2	Unnamed creek		Open	I		
282.4/291.3	Unnamed creek		Open	I		
283.5/291.9	Unnamed creek		Open	I		
285.3/294.2	Mt. Diablo Creek	<100	Open	I		
287.7/296.6	Walnut Creek	<100	Open	P	WC	
288.3/297.2	Pacheco Creek	150	Drill	P	WC	S
Sacramento Mainline						
San Joaquin River Basin						
4.0	Unnamed creek		Open	I		
5.0	Unnamed creek		Open	I		
8.1/9.2	Lone Tree Creek	<100	Open	I		
10.8	Unnamed creek		Open	I		
11.1/11.8	Littlejohns Creek (2 crossings)	<100	Open	I		R
Sacramento-San Joaquin Delta Basin						
14.0	Unnamed creek	<100	Open	I		
14.7	Unnamed creek		Open	I		
16.3	Duck Creek	<100	Open	P		R
16.5	Mormon Slough	<100	Open	P		R
17.0	Mormon Slough	<100	Open	P		R
24.1	Calaveras River	<100	Drill	P		S, R
24.7	Mosher Creek	<100	Open	I		S
25.6	Mokelumne Aqueduct		Bore	B		
26.1	South Paddy Creek	<100	Open	P		
27.3	Middle Paddy Creek		Open	I		
29.4	Bear Creek	<100	Open	P		R
32.0/32.3	Mokelumne River	100	Drill	P	W	S, R
38.3	Coyote Creek	<100	Open	I		
39.0	Dry Creek	<100	Open	P		
40.6	Skunk Creek	<100	Open	I		
43.5	Laguna River	<100	Open	P		
45.7	S. Fork Badger Creek	<100	Open	I		
46.1	Unnamed creek	<100	Open	I		
49.7	N. Fork Badger Creek	<100	Open	I		V
50.2	Unnamed creek		Open	I		
52.0	Cosumnes River	<100	Drill	P	W	S, R
52.5	Deer Creek	<100	Open	P		

TABLE 4.3.2-1 (cont'd)

Segment and Milepost a/	Water Crossing	Channel Width b/	Construction Method c/	Status d/	Fishery e/	Sensitive Crossing f/
Sacramento River Basin						
55.3	Unnamed creek	<100	Open	I		V
56.4	Laguna Creek	<100	Open	I	W	V
Lindsay Segment						
Tulare Lake Basin						
0.9/75.4	Tulare Irrigation Canal		Bore	C		
3.8/72.5	Tulare Canal		Open	I		
5.6/71.0	Tulare Ditch		Open	I		
6.1/70.2	Farmer's Dtich		Open	I		
6.9/69.4	Unnamed creek		Open	I		
8.6/67.6	Outside creek	100	Open	I		
8.9/67.3	Gray Ditch		Open	I		
Coalinga Segment						
Tulare Lake Basin						
2.4	Unnamed creek		Open	I		
3.8	Unnamed creek		Open	I		
6.0	Highline Canal		Bore	C		
6.2, 6.4, 6.7	Cross Creek (3 crossings)	<100	Open	I		R
7.0	Lakeside Ditch		Open	I		
8.5	Melga Canal		Bore	C		
9.2	Settler's Ditch		Open	I		
12.2	People's Ditch (East Branch)	<100	Open	I		
14.1	People's Ditch		Open	I		
15.3	Last Chance Ditch		Open	I		
16.9	Last Chance Ditch, Center Branch		Open	I		
18.0	Last Chance Ditch, West Branch		Open	I		
19.6	Lemoore Canal		Bore	C		
22.5	Unnamed wash		Open	I		
23.1	Unnamed wash		Open	I		
25.3	North Kings River	100	Drill	P	W	S, R
25.4	Unnamed creek		Open	I		
37.5	California Aqueduct		Bridge	C	W	S
43.7	Los Gatos Creek	<100	Open	I		
48.9	Unnamed creek		Open	I		
49.2	Unnamed creek		Open	I		
Sanger Segment						
Tulare Lake Basin						
0.9	Washington Colony Canal		Bore	C		
3.5	Briggs Canal		Bore	C		
6.9	Fowler Switch Canal		Bore	C		
9.0	Garfield Ditch		Open	I		
10.9	Lonetree Ditch		Open	I		

TABLE 4.3.2-1 (cont'd)

Segment and Milepost a/	Water Crossing	Channel Width b/	Construction Method c/	Status d/	Fishery e/	Sensitive Crossing f/
Ceres Segment						
San Joaquin River Basin						
1.7	Unnamed creek		Open	I		
Modesto B Segment						
San Joaquin River Basin						
0.5	Dry Creek	<100	Open	I		
1.4	East Modesto Aqueduct		Bore	B		
Tracy Segment						
San Joaquin River Basin						
1.1	Main Canal		Bore	C		
Palo Alto Segment						
San Francisco Bay Basin						
1.8	Arroyo Seco	<100	Open	I		
1.1, 1.7	South Bay Aqueduct		Bore	C		
2.3	Arroyo Mocho	100	Open	I		
6.3	Arroyo Valle	150	Open	I		
13.6	Alameda Creek	<100	Open	I	C	
14.0	San Antonio Creek	<100	Open/Case	P		
15.5	Hetch-Hetchy Aqueduct		Bore	B		S
14.5/15.8	Sheridan Creek (2 crossings)	<100	Open	I		
24.0	Aqueduct	<100	Open	I		
25.0	Scott Creek		Bore	B		
28.3	Coyote Creek	<100	Open	I	C	S
32.4	Guadalupe River	<100	Drill	P	C	S
35.9	Saratoga Creek	<100	Open	I		
36.5	Calabazas Creek		Open	I		
41.4	Stevens Creek		Open	I		
42.8	Permanente Creek		Open	I		
44.4	Adobe Creek		Open	I		
45.5	Matadero Creek		Open	I		
Antioch Segment						
San Francisco Bay Basin						
1.5	Mokelumne Aqueduct		Bore	B		
3.0	Dowest Slough	<100	Open	I		
3.5	Contra Costa Canal		Bore	C		

TABLE 4.3.2-1 (cont'd)

Segment and Milepost a/	Water Crossing	Channel Width b/	Construction Method c/	Status d/	Fishery e/	Sensitive Crossing f/
Fremont Segment						
San Francisco Bay Basin						
0.5, 0.9/0.5, 0.9	2 unnamed creeks		Open	I		
1.4	Torages Creek		Open	I		
10.4	Hetch-Hetchy Aqueduct		Bore	B		
Loop 4						
Tulare Lake Basin						
5.6	Arvin-Edison Canal		Case	C		
11.1	Caliente Creek		Open	I		
13.4	Unnamed creek		Open	I		
15.8	Unnamed creek		Open	I		
17.4	Unnamed creek		Open	I		
18.8	Unnamed creek		Open	I		
ADDITIONAL FACILITIES TO SERVE ALTERNATIVE CUSTOMER GROUP 1						
Lathrop Segment						
San Joaquin River Basin						
1.7/–	Unnamed creek		Open	I		
4.0/–	Unnamed creek		Open	I		
5/–	Unnamed creek		Open	I		
5.6/–	Unnamed creek		Open	I		
6.5/–	San Joaquin Irrig. District Canal		Bore	C		
Oakland Segment						
San Francisco Bay Basin						
1.7, 2.7/–	2 unnamed creeks		Open	I		
2.2,2.4,2.6,2.7/–	Arroyo Valley		Open	I		S
5.3/–						
7.6/–	Arroyo Mocho	<100	Open	I		
8.0/–	Tassajara Creek	<100	Bore	I		
8.7/–	Hewlett Canal		Bore	C		
9.5/–	Chabot Canal		Bore	C		
10.4/–	San Ramon Creek	<100	Open	I		
12.3/–	Unnamed creek		Open	I		
14.7/–	Unnamed creek	<100	Open	I		
19.3/–	Crow Creek	<100	Open	I		
19.5/–	Cull Creek	<100	Open	I		
20.3/–	Unnamed creek		Open	I		
21.5/–	Unnamed creek		Open	C		
22.9/–	Estudillo Canal		Bore	I		
27.4/–	San Leandro Creek	<100	Open	I		

TABLE 4.3.2-1 (cont'd)

Segment and Milepost a/	Water Crossing	Channel Width b/	Construction Method c/	Status d/	Fishery e/	Sensitive Crossing f/
ADDITIONAL FACILITIES TO SERVE ALTERNATIVE CUSTOMER GROUP 2						
Lindsay Alternative						
Tulare Lake Basin						
–/18.4	Unnamed creek		Open	I		
–/18.8	Unnamed creek		Open	I		
–/19.5	Unnamed creek		Open	I		
–/20.0	Unnamed creek		Open	I		
–/20.5	Unnamed creek	<100	Open	I		
Lindsay Alternative, Tulare Lake Basin (cont'd)						
21.2/4.8	Unnamed creek		Open	I		
21.9/5.5	South Fork, Dyer Creek	<100	Open	I		
22.2/5.8	North Fork, Dyer Creek		Open	I		
23.0/6.6	Unnamed creek		Open	I		
23.8/7.4	Unnamed creek		Open	I		
25.4/8.9	Unnamed creek		Open	I		
26.2/9.8	Unnamed creek		Open	I		
27.0/10.7	Unnamed creek		Open	I		
27.9/11.5	Unnamed creek		Open	I		
28.2/11.8	Rag Gulch	<100	Open	I		
29.3/12.9	Unnamed creek		Open	I		
29.9/13.5	Unnamed creek		Open	I		
30.5/14.2	Unnamed creek		Open	I		
31.4/14.9	Unnamed creek	<100	Open	I		
32.6/16.2	Unnamed creek		Open	I		
33.4/17.0	Unnamed creek		Open	I		
34.8/18.4	White River	<100	Open	I		S
42.5/26.3	Deer Creek	<100	Open	I		
48.3/31.9	Tule River	<100	Open	I		R
50.7/34.3	Porter/Bates Slough	<100	Open	I		R
51.5/35.1	Friant Kern Canal		Bridge	C		S
McFarland Segment - See Core Project, North Mainline, Tulare Lake Basin, MP 19.2 to MP 25.4.						
Madera Segment						
San Joaquin River Basin						
–/0.3	Cottonwood Creek	<100	Open	I		R
–/1.5	Unnamed lateral					
–/3.3	Hugh Ditch					
–/5.1	Unnamed lateral	<100	Open	I		

TABLE 4.3.2-1 (cont'd)

Segment and Milepost a/	Water Crossing	Channel Width b/	Construction Method c/	Status d/	Fishery e/	Sensitive Crossing f/
Sacramento Segment						
Sacramento River Basin						
–/2.5	Unnamed creek	<100	Open	I		
–/6.0	Laguna Creek	<100	Open	I	W	V
Antioch (A-174) Segment						
San Francisco Bay Basin						
–/0.5	Contra Costa Canal		Bore	C		
–/1.7	Unnamed creek		Open	I		
–/3.8	Unnamed creek		Open	I		
Hunters Point Segment						
San Francisco Bay Basin						
–/1.2	San Francisquito Creek	<100	Open	I		S
–/2.8	Irrigation Ditch		Open	I		
–/6.5	Cordilleras Creek	<100	Bore	I		
–/7.5	San Carlos Creek		Open	I		
–/8.5	Belmont Creek		Open	I		
–/10.5	Laurel Creek	<100	Open	I		
–/13.3	San Mateo Creek		Bridge	C		
–/16.4	Mills Creek		Open	I		
–/21.4	Colma Creek	75	Bridge	I		

---

a/ Where two milepost numbers are given separated by a slash, the first number is the milepost in the pipeline configuration to serve Alternative Customer Group 1 in addition to the Core Customer Group, and the second number is the milepost in the pipeline configuration to serve Alternative Customer Group 2 in addition to the Core Customer Group. Where only one milepost number is given, the pipeline configuration would be the same in that area to serve both alternative customer groups. Where no number is given before or after the slash, the entry only applies to one configuration or the other.

b/ Channel widths were taken from aerial alignment maps; canals and ditches were not measured; other crossings not measured could not be identified on the maps.

c/ The construction methods were either derived from table 1-2 of the resource report, or, if not in the table, estimated from Mojave's description of stream crossing methods; these methods are subject to change on the basis of the final engineering studies.

d/ P = perennial; I = intermittent; C = lined canal; B = buried; status of the stream was determined from USGS topographic maps; all named canals were assumed to be lined; ditches were assumed to be unlined unless more specific information was available; several aqueducts identified as stream crossings are actually large buried pipelines, and, although they will be treated as utility crossings, they were left in this table to show that they have been considered.

e/ C = coldwater; W = warmwater; no coldwater fisheries are present in the river reaches crossed by the proposed pipeline route, except for creeks supporting anadromous species; fisheries were identified from table 3-3 of the resource report.

f/ S = sensitive habitat crossings identified in the biological survey; V = vernal pools; R = streams regulated by the California Reclamation Board.

4.4 VEGETATION

Both human-influenced and natural vegetative communities are encountered along the pipeline route. About 78 percent of the total route crosses human-influenced areas, which support a variety of vegetation ranging from near natural to essentially absent. Human-influenced areas are defined as areas that have been extensively altered by human activities such as agricultural lands and disturbed or ruderal lands including urban and industrial areas. These areas provide limited habitat for a variety of species, and no attempt has been made to distinguish these areas' minor differences in vegetation in the three physiographic provinces.

The remaining 22 percent of the proposed route crosses natural areas unaltered by human activities. Although many of these vegetative communities are unique to one of the three physiographic provinces — Mojave Desert, Central Valley, or Coast Ranges-San Francisco Bay Area - several communities do overlap between the Central Valley and Coast Ranges. Because of the differences in topography and climate, the species compositions vary considerably.

Our analysis was based on the results of the biological survey conducted by Mojave for the proposed project, which focused on the general habitats crossed by the proposed route and the species of concern that could be affected by the proposed project. Each significant natural community affected is discussed in the numbered subsections that follow, which are organized by physiographic province. Both human-influenced and natural communities are found in each province although some are more common in one province than another, in which case that discussion is referenced. The locations of the vegetative communities are shown on the maps in volume II. Common names of species are used below, but a cross-reference between common and scientific names is provided in table 4.4-1.

Wetlands

Mojave has not yet conducted field delineations of the Federal and state jurisdictional wetlands that would be affected by the proposed project, but Mojave would do so before starting construction. Jurisdictional wetlands are defined as:

> Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (33 CFR 328.3 and 40 CFR 230.3).

The Federal jurisdictional wetlands crossed by the proposed route would be identified using the three criteria in the "Corps of Engineers Wetlands Delineation Manual": hydrophytic vegetation, hydric soils, and wetland hydrology (USACE, 1987). Hydrophytic vegetation consists of plants typically adapted to the anaerobic soil conditions created by periodic inundation or saturation. Hydric soils are formed under prolonged anaerobic soil conditions, which create a reducing environment, and the chemical reduction of some soil components creates distinctive soil colors and other physical properties. Wetland hydrology is influenced by numerous factors such as precipitation, topography, soil permeability, and plant cover, which combine to create conditions of periodic inundation or surface soil saturation persisting long enough during the growing season to determine the prevalent plant community.

TABLE 4.4-1

Common and Scientific Names of Plants Potentially Occurring Along the Proposed Route

Common Name	Scientific Name
Alkali barley	*Hordeum depressum*
Alkali heath	*Frankenia salina*
Alkali cordgrass	*Spartina gracilis*
Alkali saccaton	*Sporobolus airoides*
Arabian schismus	*Schismus arabica*
Blackbrush	*Coleogyne ramosissima*
Blue oak	*Quercus douglasii*
Bulrush	*Scirpus spp.*
Bur clover	*Medicago hispida*
Burobush	*Hymenoclea sciloola*
Bursage	*Ambrosia dumosa spinosa*
California black oak	*Quercus kelloggii*
California buckeye	*Aesculus californica*
California coffeeberry	*Rhamnus californica*
Canyon live oak	*Quercus chrysolepis*
Catsclaw	*Acacia greggii*
Cattail	*Typha spp.*
Cottenwood	*Populus fremontii*
Creosote bush	*Larrea tridentata*
Digger pine	*Pinus sabiniana*
Elderberry	*Sambucus mexicana*
Few-flowered fescue	*Vulpia microstachys*
Fiddleneck	*Amsinckia spp.*
Filaree	*Erodium cicutarium*
Gilia	*Gilia spp.*
Goldenrod	*Solidago spp.*
Goldfields	*Lasthenia spp.*
Hare barley	*Hordeum leporinum*
Hispid bird's-beak	*Cordylanthus mollis*
Hollyleaf buckthorn	*Rhamnus crocea*
Interior live oak	*Quercus wislizenii*
Iodine bush	*Allenrolfea occidentalis*
Ironwood	*Olneya tesota*
Italian ryegrass	*Lolium multiflorum*
Jaumea	*Jaumea cornosa*
Joshua trees	*Yucca brevifolia*
Lupine	*Lupinus spp.*
Mugwort	*Artemisia californica*
Needlegrass	*Stipa spp.*
Nettle	*Urtica dioica*

TABLE 4.4-1 (cont'd)

Common Name	Scientific Name
Oregon ash	*Fraxinus latifolia*
Owl's clover	*Orthocarpus sp.*
Paleleaf goldenweed	*Ericameria sp.*
Palo verde	*Cercidium spp.*
Peppergrass	*Lepidium spp.*
Phacelia	*Phacelia spp.*
Pickleweed	*Salicornia virginica*
Poison oak	*Toxicodendron diversilobum*
Ragweed	*Ambrosia spp.*
Rat tail fescue	*Vulpia myuros*
Red brome	*Bromus rubens*
Ripgut brome	*Bromus diandrus*
Russian thistle	*Salsola tragus*
Salt grass	*Distichlis stricta*
Saltbush, Bakersfield	*Atriplex tularensis*
, Lost Hills	*A. vallicola*
, San Joaquin	*A. joaquiniana*
, Spiny	*A. spinifera*
Sedge	*Carex spp.*
Shadscale	*Atriplex confertifolis*
Shrubby willows	*Salix spp.*
Soft chess	*Bromus mollis*
Spiny hopsage	*Grayia spinosa*
Sueada	*Sueada spp.*
Tarweed	*Madia spp.*
Toad rush	*Juncus bufonius*
Tule	*Scirpus sp.*
Turpentine-brush	*Ericameria laricifolia*
Valley oak	*Quercus lobata*
Virgins bower	*Clematis ligusticifolia*
Wild oats	*Avena fatua, A. barbata*
Wildgrape	*Vitis californica*
Wildrye	*Leymus triticoides*

California Fish and Game Code Sections 1601 and 1603 regulate construction projects that could "divert, obstruct, or change the natural flow or bed, channel or bank of any river, stream or lake designated by the [DFG]." These regulations cover all rivers, streams, lakes, and stream beds that have intermittent flows of water.

Lacking jurisdictional wetland delineations, the wetlands crossed by the proposed route were initially identified using FWS National Wetland Inventory (NWI) maps. Many of the features indicated as wetlands on the NWI maps were found not to be Federal jurisdictional wetlands during the biological survey, which was performed to verify habitat types. Pending verification by the field wetlands delineations yet to be completed, we assumed that several habitat types are indeed jurisdictional wetlands: riparian areas including woodland, scrub-shrub, and herbaceous communities; seasonal wetlands; vernal pools; nonnatural ponding areas; alkali lowlands; and coastal brackish and salt marshes. Some of these areas might not meet all of the jurisdictional criteria; however, for the purpose of this EIR/EIS, we included these areas as "wetlands" to ensure their receiving similar protection and mitigation because of their similar ecological values. These wetland communities were identified using NWI maps as well as information collected during the biological survey. Each wetland community is discussed in the subsections that follow, and the approximate acreages of the various wetland types crossed by the proposed route and each wetland's corresponding NWI classification are listed in table 4.4-2 at the end of section 4.4.

4.4.1 Mojave Desert

Most of the proposed route through the Mojave Desert crosses ruderal lands, which consist mostly of previously disturbed pipeline rights-of-way. Most of the rest of the route crosses typical desert scrub areas.

4.4.1.1 Ruderal Communities

The ruderal communities are associated with railroads, highways, and oil production or other extensively disturbed areas, which may contain abandoned structures, roads, equipment, and disturbed soil. The vegetation consists primarily of weedy species such as russian thistle, annual grasses, and forbs with limited species diversity. Loop 3 would be within the previously disturbed rights-of-way of the Mojave Mainline and Commonline, which were constructed in 1991. Approximately 20 feet of additional new right-of-way would be temporarily disturbed for Loops 1 and 2. The existing rights-of-way support a few species of annual grasses and other opportunistic plant species. Some natural communities have begun to reestablish but are in early successional stages. The urban and industrial areas are so heavily developed that the vegetation is restricted to lawns and scattered ornamental plantings of trees and shrubs with some annual grasses and forbs and other weedy vegetation.

4.4.1.2 Agricultural Communities

There is little cultivated land along the proposed route through the Mojave Desert.

4.4.1.3 Natural Communities — Mojave Desert Scrub

The Mojave desert scrub community consists of creosote bush and wash components. Creosote bush dominates, but the community's overall species composition varies with environmental factors such as soil type, soil moisture, and topography. Common shrubs are bursage, spiny hopsage, turpentine bush, burrobush, shadscale, saltbrush, and blackbrush. Joshua trees are sparsely distributed at higher elevations. Various species of cacti and yuccas are sparsely distributed throughout the entire community. Catsclaw, palo verde, and ironwood occur in washes and arroyos. The relatively sparse intershrub areas may be 50 feet or more in diameter and almost devoid of apparent vegetation during the summer and fall, but, if there is sufficient precipitation in late winter, a dense growth of annual and perennial plants can occur. The Mojave wash component is similar to the creosote bush component but is characterized by higher shrub density, diversity, and cover due to more favorable growth conditions.

4.4.2 Central Valley

The proposed route through the Central Valley crosses mostly disturbed, human-influenced lands. Most of the route is within existing railroad rights-of-way (see figure 2.3.1-1). The natural communities crossed are identified in section 5.4.3.

4.4.2.1 Ruderal Communities

As described in section 4.4.1.1, these disturbed communities are associated with railroads, highways, and other highly disturbed lands. The vegetation is limited to weedy species of grasses, forbs, and shrubs with relatively little diversity.

4.4.2.2 Agricultural Communities

Agricultural croplands, orchards, and vineyards dominate the landscape crossed by the proposed route through the Central Valley. Generally located on irrigated fertile soils, these communities contain introduced species of annual crops, fruit and nut trees, grapes, and hay and primarily feature the individual plant species being cultivated; however, annual grasses, forbs, and weedy species occur on the communities' borders and in uncultivated patches. There are farms that consist mainly of pasturelands with associated roads, farm houses, barns, and ornamental plantings.

4.4.2.3 Natural Communities

Nonnative Grassland Communities

Grasslands dominated by native herbs and introduced annual Mediterranean grasses are the most common natural community along the proposed route through the Central Valley. Native species such as needle grass have been largely or entirely supplanted by introduced grasses. As a result, the communities are largely referred to as nonnative grasslands. Characteristic nonnative species are red brome, soft chess, ripgut brome, hare barley, wild oats, Italian ryegrass, Arabian schismus, rat-tail fescue, filaree, and bur-clover. Characteristic native species are few-flowered fescue, fiddleneck, goldfields, peppergrass, tarweed, lupine, gilia, owl's clover, and phacelia. These grasses and flowering plants germinate with the onset of late fall and winter rains. Growth, flowering, and seed-set occur winter through spring. The annual plants die by summer, but their seeds persist until the next winter rains. These grasslands are present mainly along the southern 16.5 miles of the North Mainline but also in scattered areas along the rest of the North Mainline, Sacramento Mainline, Coalinga and Tracy Segments, and Loop 4.

Chenopod Scrub Communities

Chenopod scrub communities are generally found in areas dominated by an arid Mediterranean-like climate. Two distinct subcommunities occur along the proposed route: the valley sink scrub and valley saltbush scrub. The valley sink scrub community is a low, open to dense, succulent shrubland dominated by alkali-tolerant chenopods such as iodine bush and sueada. This community generally lacks an herbaceous understory although scattered grasses are found. Dominant species within valley saltbush scrub communities are common saltbush and spiny saltbush. Characteristic species of the understory include paleleaf goldenweed, creamcups platystemon, spikeweed, Bakersfield saltbush, Lost Hills saltbush, San Joaquin saltbush, hispid bird's-beak, and alkali heath. Much of the chenopod scrub habitat in the Central Valley has been converted to irrigated farmland, dramatically reducing the populations of plants and associated animals that rely on this type of habitat. Chenopod scrub communities would be crossed by portions of the North Mainline and Coalinga Segment.

Wetland Communities

Riparian Woodland Communities — Riparian vegetation occurs along streams and is typically dominated by deciduous woody shrubs or trees. Unlike grasslands or deserts, riparian communities cannot thrive with only the precipitation that falls in the immediate area. Riparian communities in the Central Valley flourish along stream channels that carry runoff from rainfall or melting snow in the high Sierra. The vegetation in mature riparian forest, often called gallery forest, consists of three layers: tree canopy, shrub understory, and herbaceous understory or ground cover. Climbing vines or lianas intertwine with the vegetation in every layer and include wild grape and virgin's bower. Mature riparian forests are typically dominated by valley oak or cottonwood in the overstory. Elderberry, Oregon ash, and shrubby willows comprise the shrub understory with the willow growing nearest the streams. The herbaceous understory consists of wildrye, mugwort, ragweed, goldenrod, sedge, and nettle.

Riparian Scrub-Shrub Communities — These communities generally occur where riparian woodlands have been cleared or otherwise disturbed. Riparian scrub-shrub may also represent early successional stages of riparian woodland. Dominant species include willows and elderberry, and saplings of these trees are typically found in the woodland overstory. Depending on the density of the shrub layer, the herbaceous layer can range from dense to sparse.

Riparian Herbaceous Communities — These communities in the Central Valley are dominated by perennial, emergent monocots such as tule, bulrush, and cattail, which often grow in dense stands up to 16 feet tall. They occur in backwater areas that are seasonally or permanently flooded in conjunction with riparian woodland and scrub-shrub communities. For the purposes of this EIR/EIS, no purely undisturbed riparian herbaceous communities have been delineated. Riparian areas identified as heavily disturbed during the biological survey have been broadly classified as riparian herbaceous wetlands although they are not vegetated with the typical emergent monocots that define riparian marshes; they are dominated primarily by opportunistic herbaceous vegetation that is typically associated with secondary succession in these riparian zones.

Seasonal Wetlands — Seasonal wetlands are defined as low-lying areas that meet the USACE criteria for jurisdictional wetlands during the wetter part of the growing season but not during the drier part of the growing season. Seasonal wetlands support typical riparian vegetation such as grasses and rushes, but are not associated with stream crossings. They can be associated with minor seeps or seasonal high water tables. Seasonal wetlands are generally scattered along the proposed route through the Central Valley in association with nonnative grasslands.

Vernal Pools — Grasslands in the northern Central Valley often contain vernal pools, which are a specific type of ephemeral wetland that forms when winter and spring rains fill depressions or swales in the grassland. These pools provide important habitats for a multitude of plant and animal species. Of seven different vernal pool communities that are known to occur in California, only one, the northern claypan vernal pool, is found along the proposed route. It is a low-elevation, herbaceous community dominated by annual herbs and grasses. Plant germination and growth begin with winter rains and continue even when inundated. The pools slowly evaporate in the spring, leaving concentric bands of vegetation. These pools vary from a few square meters to several acres. The locations and sizes of vernal pools are listed in table 4.4-3. During the biological survey of the proposed route, vernal pools were found: on the North Mainline between MP 80/89 and MP 82/91, between MP 135/143 and MP 137/145, and between MP 138/146 and MP 140/148; on the Sacramento Mainline between MP 42 and MP 46 and between MP 48 and MP 50; and on the Sacramento (A-159) Segment between MP 2 and MP 4 and between MP 5 and MP 7.

Nonnatural Ponding Areas — These areas are sparsely to nonvegetated depressions resulting from disturbance in nonnative grasslands. They are defined as disturbed low-lying areas with clay soils where winter rains collect for up to five months. They are generally found along transportation rights-of-way. The vegetation in these areas is not characteristic of vernal pools; however, many nonnatural ponding areas have been found to support sensitive invertebrate species typical of vernal pools. The locations and sizes of nonnatural ponding areas are listed in table 4.4.2.3-1.

4.4.3 Coast Ranges - San Francisco Bay Area

4.4.3.1 Ruderal Communities

The ruderal communities in the Coast Ranges-San Francisco Bay Area are generally as described in sections 4.4.1.1 and 4.4.2.1.

4.4.3.2 Agricultural Communities

The agricultural communities in the Coast Ranges-San Francisco Bay Area are generally as described in section 4.4.2.2.

4.4.3.3 Natural Communities

Nonnative Grasslands

The nonnative grasslands in the Coast Ranges-San Francisco Bay Area are generally as described in section 4.4.2.3 for the Central Valley except, because of the differences in climate and topography, the species composition of Coast Ranges grasslands is different from that of Central Valley grasslands. For example, wild oats are a relatively insignificant component of Central Valley grasslands but a common component of Coast Ranges grasslands.

Foothill Woodlands Communities

Three types of foothill woodland communities occur in valley bottoms and on gentle to steep, north-facing slopes in the Coast Ranges: blue oak, valley oak, and mixed north slope cismontane oak. These separate communities are often found interspersed as a result of slight variations in microhabitat. All three woodlands are characterized by open to dense canopies of trees and valley with foothill grassland

TABLE 4.4.2.3-1

Vernal Pools and Nonnatural Ponding Areas In or Adjacent to the Proposed Route

		Vernal Pools		Nonnatural Ponding Areas	
Segment and Milepost a/	Type of Wetland b/	Dimensions (feet)	Approx. Length in Const. ROW (feet)	Area Affected by Const. ROW c/ (acres)	Area in Const. ROW d/ (acres)
CORE PROJECT					
North Mainline					
80.60/89.10	Vernal pool	30 x 20	0.014	--	--
80.65/89.15	Vernal pool	10 x 25	0.006	--	--
80.80/89.30	Vernal pool	6 x 70	0.010	--	--
81.15/89.65	Vernal pool	12 x 20	0.006	--	--
81.30/89.80	Vernal pool	25 x 200	0.043	--	--
128.5/137.1	Nonnatural ponding	--	--	800	1.38
135.5/144.0	Vernal pool/nonnatural ponding e/	20 x 25	0.011	600	1.03
136.3/144.8	Nonnatural ponding	--	--	550	0.947
137.3/145.8	Nonnatural ponding	--	--	200	0.344
137.6/146.1	Nonnatural ponding	--	--	2,000	3.44
138.8/147.3	Nonnatural ponding	--	--	300	0.517
139.1/147.6	Vernal pool	175 x 175	0.301	--	--
139.25/147.75	Vernal pool	22 x 32	0.016	--	--
152.7/161.3	Nonnatural ponding	--	--	200	0.344
152.9/161.5	Nonnatural ponding	--	--	25	0.043
156.2/164.8	Nonnatural ponding	--	--	300	0.517
167.6/176.4	Nonnatural ponding	--	--	10,500	18.1
250.4/259.1	Vernal pool	f/	--	--	--
286.2/295.0	Vernal pool	20 x 40	0.018	--	--
Sacramento Mainline					
5.1	Nonnatural ponding	--	--	1,050	1.57
43.61	Vernal pool	20 x 30	0.014	--	--
46.9	Vernal pool/nonnatural ponding e/	45 x 40	0.041	2,429	3.62
49.3	Vernal pool/nonnatural ponding e/	40 x 50	0.046	2,851	4.25
52.6	Nonnatural ponding	--	--	700	1.04
53.4	Nonnatural ponding	--	--	400	0.597
53.8	Nonnatural ponding	--	--	350	0.522
59.6	Vernal pool	25 g/	0.037	--	--
57.3	Nonnatural ponding	--	--	100	0.149
62.1	Nonnatural ponding	--	--	600	0.090
Sacramento Segment (A-159)					
1.75	Vernal pool	112 x 25 h/	0.151	--	--
2.65	Vernal pool	300 x 50	0.344	--	--
2.85	Vernal pool	40 x 30	0.028	--	--
2.9	Vernal pool	50 x 40	0.046	--	--
6.2	Vernal pool	30 x 30	0.021	--	--
6.55	Vernal pool	340 x 250	0.507	--	--

TABLE 4.4.2.3-1 (cont'd)

---

a/ Where two milepost numbers are given separated by a slash, the first number is the milepost in the pipeline configuration to serve Alternative Customer Group 1 in addition to the Core Customer Group, and the second number is the milepost in the pipeline configuration to serve Alternative Customer Group 2 in addition to the Core Customer Group. Where only one milepost number is given, the pipeline configuration would be the same in that area to serve both alternative customer groups. Where no number is given before or after the slash, the entry only applies to one configuration or the other.

b/ Vernal pools and nonnatural ponding areas are defined in section 4.4.2.3.

c/ The dimensions given in the biological survey report were assumed to be length along ROW and width of pool. If the construction ROW width was greater than the pool width, the area of the pool is given here. If the pool width was greater than the construction ROW width, the area given here is the length of the pool times the construction ROW width. The construction ROW width was taken from table 1-2 in Mojave's application and is 30, 65, or 75 feet depending on the proposed diameter of the pipe.

d/ The area affected given here is the length of the nonnatural ponding area times the construction ROW width.

e/ Vernal pools located within nonnatural ponding areas.

f/ No dimensions were given in the biological survey report.

g/ A 25-foot length of construction ROW crosses a swale pool.

h/ Five small, shallow pools are on the edge of the ROW; they range from 12 x 7 feet to 25 x 100 feet. As a worst-case, we assumed that four of the pools are 25 x 100 feet; therefore, (4 x 25) + 12 = 112.

species growing in the open spaces. Most of the foothill woodlands crossed by the proposed route are isolated stands of trees in the midst of nonnative grasslands. Such foothill woodland communities occur in scattered locations on the North Mainline and Palo Alto and Oakland Segments.

Blue Oak — This is the most commonly encountered foothill woodland community in the interior Coast Ranges. It is a highly variable, climax foothill woodland in which blue oak dominates the canopy trees and is interspersed with other oak species and digger pine. Stands vary from open savannas with annual grass and forb understories to fairly dense woodlands with scattered patches of shrubby understory.

Valley Oak — This is a foothill woodland community typically found in valley bottoms below an elevation of 2,000 feet. It is similar to blue oak woodland but more open, forming a grassy-understory savanna rather than a closed woodland. Characteristic species are valley oak, blue oak, creeping wildrye, California buckeye, California black oak, interior live oak, hollyleaf buckthorn, California coffeeberry, and poison oak.

Mixed North Slope Cismontane Oak — This is a foothill woodland community dominated by broad-leaved trees 20 to 60 feet tall in stands that vary from nearly closed forests to open savannahs. Nonnative grassland species predominate in the open spaces, and other herbaceous species predominate in the shaded areas. Characteristic species include California buckeye, canyon live oak, California black oak, valley oak, and interior live oak.

Wetlands

Riparian woodland, riparian scrub-shrub, riparian herbaceous communities, vernal pools, and nonnatural ponding areas in the Coast Ranges-San Francisco Bay Area are generally as described in section 4.4.2.3 for the Central Valley. These areas are crossed by the proposed route at most if not all of the stream crossings in this region. Vernal pools were found during the biological survey along the North Mainline near MP 250/259 in Alameda County and near MP 286/295 in Contra Costa County.

Alkali Lowlands — The alkali lowlands along the proposed route are three closely related subcommunities: valley sacaton grassland, alkali meadow, and cismontane alkali marsh. Components of the chenopod valley sink scrub community described in section 4.4.2.3 can also be present at the higher elevations where hydrological conditions vary. All of these communities develop in flat or gently sloped valley bottoms with saline and alkaline soils, and variations in soils, topography, and surface drainage create a mosaic of vegetation patterns. Valley sacaton grassland is characterized by salt grass, alkali barley, and alkali sacaton bunchgrass. Alkali meadow contains the same species plus more characteristic wetland species such as iodine bush, hispid bird's-beak, toad rush, alkali cordgrass, and sedges. Cismontane alkali marsh contains many of the alkali meadow species plus species adapted to longer periods of inundation such as cattail, pickleweed, and alkali heath.

Coastal Brackish Marshes — The coastal brackish marsh and northern coastal salt marsh communities support similar species and are often found interspersed along the proposed route. Coastal brackish marshes usually occur at the interior edges of coastal bays and estuaries and are dominated by perennial, emergent, herbaceous monocots such as sedges, rush, bulrush, and cattail as well as pickleweed and salt grass.

TABLE 4.4-2

Wetlands Crossed by the Proposed Route

Segment and Milepost a/	Type of Wetland b/	Name of Stream Crossing	Approximate Length Crossed (feet) c/	Perm. ROW Affected (acres) d/	Const. ROW Affected (acres) e/	NWI Classification f/
CORE PROJECT						
North Mainline (Famoso Alternative)						
10.2	Riparian - woodland	Poso Creek	345	0.079	0.594	R4SBC
23.1 g/	Riparian - scrub	Poso Creek	110	–	0.189	R4SBC
23.4 g/	Riparian - scrub	Poso Creek	135	–	0.232	R4SBC
40.9/–	Riparian - herbaceous	White River	60	–	0.103	R4SBKx
44.9/–	Riparian - scrub	Deer Creek	135	–	0.232	R2UBHx
57.6/–	Riparian - herbaceous	Tule River South	135	–	0.232	R4SBKx
58.7/–	Riparian - scrub	Tule River North	135	–	0.232	R4SBKx
60.4/–	Riparian - woodland	Elk Bayou	185	0.042	0.319	PSSC
70.5/79.2	Riparian - herbaceous	Packwood Creek	85	–	0.146	R4SBKx
80.8/89.4	Riparian - scrub	Cross Creek	60	–	0.103	R4SBC
88.3/96.9	Seasonal wetland	–	528	0.121	0.909	PFOC
88.4/97.1	Riparian - woodland	Kings River	600	–	–h/	R2UBH
121.7/130.2	Riparian - woodland	San Joaquin River	450	–	–h/	R2UBH
129.2/137.8	Riparian - woodland	Cottonwood Creek	325	0.075	0.560	PSSW
133.4/141.8	Riparian - scrub	Fresno River	150	–	0.258	R4SBY
136.6/145.1	Riparian - scrub	Schmidt Creek	528	–	0.909	R4SBX
139.8/148.4	Riparian - scrub	Berenda Creek	60	–	0.103	PSSW/PFOW
146.8/155.4	Riparian - herbaceous	Berenda Slough	485	–	0.835	R4SBY
148.8/157.6	Riparian - woodland	Ash Slough Canal	785	0.180	1.35	R4SBY
151.2/159.8	Riparian - woodland	Chowchilla River	480	0.110	0.826	PSSW/PFOW
154.0/162.6	Riparian - scrub	Dutchman Creek	60	–	0.103	R4SBY
156.6/165.2	Riparian - woodland	Deadman Creek	60	0.014	0.103	PFO/EMW
160.9/169.4	Riparian - woodland	Duck Slough	30	0.007	0.052	R2OWKZ
162.0/170.5	Riparian - woodland	Owen's Creek	60	0.014	0.103	PFOY
162.4/170.8	Riparian - woodland	Miles Creek	85	0.020	0.146	R2OWKZ
163.0/171.4	Seasonal wetland	–	528	–	–	i/
167.3/176.1	Riparian - woodland	Bear Creek	160	0.037	0.275	R2OWKZ
168.4/176.8	Seasonal wetland	–	792	–	1.36	PEMY
169.6/178.0	Seasonal wetland	–	792	–	1.36	PEMY
175.2/183.6	Seasonal wetland	–	528	–	0.909	R2OWKZ
182.2/190.8	Riparian - woodland	Merced River	325	–	–h/	R2OWKZ
203.3/212.0	Riparian - woodland	Tuolumne River	260	–	–h/	R2OWKZ
215.3/224.1	Riparian - woodland	Stanislaus River	225	–	–h/	R20WZ
219.9/230.6	Riparian - scrub	Walthall Slough	160	–	0.275	R2ABH
222.0/230.7	Riparian - scrub	San Joaquin River	350	–	–h/	PSSC/PSSA
249.7/258.4	Alkali lowland	–	3,700	–	5.52	POWKY
258.7/267.5	Riparian - woodland	Kellogg Creek	60	0.014	0.090	PSSY
260.9/259.1	Riparian - woodland	Marsh Creek	60	0.014	0.090	PSSY
262.1/270.8	Alkali lowland	–	1,901	–	2.85	PEMY
262.9/271.6	Alkali lowland	–	2,218	–	3.31	PEMY

TABLE 4.4-2 (cont'd)

Segment and Milepost a/	Type of Wetland b/	Name of Stream Crossing	Approximate Length Crossed (feet) c/	Perm. ROW Affected (acres) d/	Const. ROW Affected (acres) e/	NWI Classification f/
264.0/272.7	Alkali lowland	--	1,584	--	2.36	POWKZ
268.4/277.1	Riparian - woodland	Sand Creek	60	0.014	0.090	R4SBY
272.2/280.9	Riparian - woodland	Intermittent Stream	60	0.014	0.090	
285.1/294.0	Coastal brackish marsh	--	5,280	--	3.64 k/	PENA
286.9/295.8	Coastal brackish marsh	--	792	--	0.545 k/	PEMF
287.6/296.5	Coastal brackish marsh	Walnut Creek	4,224	--	2.91 k/	E2USM/E2UE
290.0/291.0	Coastal brackish marsh	Pacheco Creek j/	5,280	--	3.64 k/	E2EMPh
Sacramento Mainline						
8.2	Riparian - woodland	Lone Tree Creek	85	0.020	0.127	R2OWZ
11.8	Riparian - herbaceous	Little John Creek	60	--	0.090	R2OWZ
14.0	Riparian - woodland	North Little John Creek	30	0.007	0.045	PEMY
16.3	Riparian - herbaceous	Duck Creek	75	0.017	0.112	R20WZ
24.1	Ripairan - woodland	Calaveras River	80	--	--h/	PSS/EMY
24.8	Riparian - woodland	Mosher Creek	120	0.028	0.179	PEMY
26.1	Riparian - herbaceous	South Paddy Creek	50	--	0.075	PEMY
27.3	Riparian - herbaceous	Middle Paddy Creek	50	--	0.075	PEMY
27.8	Riparian - herbaceous	North Paddy Creek	50	--	0.075	PEMY
29.3	Riparian - herbaceous	Bear Creek	50	--	0.075	PEMY
32.3						
38.3	Riparian - woodland	Mokelumne River	1,030	--	--h/	PFOW
39.0	Riparian - woodland	Coyote Creek	155	0.036	0.231	PFOW
43.4	Riparian - woodland	Dry Creek	120	0.028	0.179	PFOY
52.0	Riparian - woodland	Laguna Creek	275	0.063	0.410	PFOY
	Riparian - woodland	Cosumnes River	350	--	--h/	R2UBH
52.5	Riparian - woodland	Deer Creek	300	0.069	0.448	PFOC
56.5	Riparian - woodland	Laguna Creek	60	0.014	0.090	R4SBC
60.6	Riparian - woodland	Laguna Creek	75	0.017	0.112	R4SBC
Coalinga Segment						
5.9	Riparian - herbaceous	East Branch Cross Creek	185	--	0.276	PEMC
6.6	Riparian - scrub	West Branch Cross Creek	85	--	0.127	
25.2	Riparian - woodland	Kings River	305	--	--h/	R4SBKx
37.3	Seasonal wetland	--	2,640	--	3.94	
43.6	Riparian - woodland	Los Gatos Creek	385	0.088	0.574	R2UBKHx PEMY R4SBW
Lindsay Segment						
8.6	Riparian - woodland	Outside Creek	1,325	0.304	0.913/ 2.28 l/	R4SBKx
Palo Alto Segment						
3.7	Riparian - woodland	Arroyo Mocho	500	0.115	0.746	
6.7	Riparian - woodland	Arroyo Valle	800	0.184	1.19	R4SBY
28.3	Riparian - woodland	Coyote Creek	285	0.065	0.425	R2UBH
32.4	Riparian - woodland	Guadelupe River	375	--	--h/	PSSC
Antioch Segment						
3.5	Coastal brackish marsh	--	528	--	0.364 k/	PEMCh
3.9	Coastal brackish marsh	--	264	--	0.182 k/	PUBFh
4.1	Riparian - scrub	--	925	--	0.637 k/	PEMR

TABLE 4.4-2 (cont'd)

Segment and Milepost a/	Type of Wetland b/	Name of Stream Crossing	Approximate Length Crossed (feet) c/	Perm. ROW Affected (acres) d/	Const. ROW Affected (acres) e/	NWI Classification f/
ADDITIONAL FACILITIES TO SERVE ALTERNATE CUSTOMER GROUP 1						
Oakland Segment						
5.3/--	Riparian - woodland	Arroyo Valle	175	0.040	0.120 k/	POWKZ
12.3/--	Riparian - woodland	Devaney Canyon Creek	85	0.020	0.059 k/	PFOC
27.3/--	Riparian - woodland	San Leandro Creek	135	0.031	0.093 k/	PFOC
Modesto B-E Segment						
0.5	Riparian - woodland	Dry Creek	60	0.014	0.041 k/	R2OWZ
ADDITIONAL FACILITIES TO SERVE ALTERNATE CUSTOMER GROUP 2						
Lindsay Alternative						
--/34.8	Riparian - scrub	White River	135	--	0.232	R4SBC
--/42.6	Riparian - herbaceous	Deer Creek	235	--	0.405	R4SBC
--/48.3	Riparian - woodland	Tule River	285	0.065	0.491	PSSA
--/51.7	Riparian - scrub	Porter Slough	85	--	0.146	R4SBC
Madera Segment						
--/0.4	Riparian - scrub	Cottonwood Creek	135	--	0.093 k/	PSSW
Hunters Point Segment						
--/1.3	Riparian - woodland	San Francisquito Creek	45	0.010	0.067	R4SBK
		Belmont Creek				PFOA
--/8.6	Riparian - herbaceous	--	60	--	0.090	PFOA
--/11.15	Seasonal wetland	San Mateo Creek	370	--	0.552	PSSR
--/13.3	Riparian - woodland	--	60	--	--	PFOA
--/15.4	Seasonal wetland		1,056	--	1.58	
--/16.3	Seasonal wetland	--	792	0.18	1.18	PFOA
--/18.4	Riparian - scrub	--	1,056	--	1.58	PEMC
San Francisco Segment						
0.70	Coastal brackish marsh	--	1,584	--	1.09 k/	E2EMP
Sacramento Segment (A-159)						
--/6.0	Riparian - herbaceous	Laguna Creek	60	--	0.090	R4SBFx
Antioch Segment (A-174)						
--/3.9	Riparian - woodland	Unnamed Creek	125	0.029	0.086 k/	PEMV
Martinez (A-172)						
--/0.0	Coastal brackish marsh	--	5,280	--	7.88	PEMCh

---

a/ Where two milepost numbers are given separated by a slash, the first number is the milepost in the pipeline configuration to serve Alternative Customer Group 1 in addition to the Core Customer Group, and the second number is the milepost in the pipeline configuration to serve Alternative Customer Group 2 in addition to the Core Customer Group. Where only one milepost number is given, the pipeline configuration would be the same in that area to serve both alternative customer groups. Where no number is given before or after the slash, the entry only applies to one configuration or the other.

TABLE 4.4-2 (cont'd)

b/ Riparian wetlands were further divided into woodland, scrub, or herbaceous as follows:
- Woodland - woodland habitat of good or fair quality identified during the biological survey
- Scrub - habitat identified as willow scrub or poor woodland
- Herbaceous - includes poor scrub habitat and herbaceous areas.

c/ For riparian wetlands, the width of the channel was subtracted from the length of the riparian area based on measurements in the biological survey report or Mojave's application. Where the width of the channel was not specified, the widths of 15 feet for intermittent streams and 25 feet for perennial streams were used. A riparian corridor width of 75 feet was assumed for riparian areas listed as less than 100 feet wide in the biological survey report.

d/ The permanent ROW affected was only calculated for riparian woodlands for which directional drilling was not proposed; a width of 10 feet was used.

e/ The construction width was taken from table 1-2 in Mojave's application and is 30, 65, or 75 feet depending on the proposed diameter of the pipe.

f/ National Wetland Inventory Map Classifications:
R2 = Lower perennial riverine
R4 = Intermittent riverine
P = Palustrine
E2 = Intertidal estuarine
SB = Streambed
UB = Unconsolidated bottom
SS = Scrub/shrub
FO = Forested
AB = Aquatic bed
EM = Emergent
OW = Open water
A = Temporary
B = Saturated
C = Seasonal
F = Semipermanent
H = Permanent
K = Artificial
P = Irregular
R = Seasonal tidal
W = Intermittently flooded/temporary
Y = Saturated/semipermanent/seasonal
Z = Intermittently exposed/permanent
h = Diked/impounded
x = Excavated

g/ Corresponds to the stream crossings at MP 6.7 and MP 7.0 on the McFarland Segment.

h/ Mojave proposes to directionally drill under these stream crossings, which would eliminate construction impact on the riparian areas; therefore, the construction ROW affected was not calculated.

i/ National Wetland Inventory classification is not applicable or available.

j/ Walnut and Pacheco Creeks flow into these coastal marshes, but, where the proposed ROW crosses, the marshes exhibit estuarine characteristics.

k/ Proposed 30-foot-width for construction ROW.

l/ In conjunction with the Famoso Alternative, the construction ROW width for the Lindsay segment is 30 feet. With the Lindsay Alternative, this segment would have a construction ROW 75 feet wide.

4.5 WILDLIFE AND AQUATIC RESOURCES

The wildlife and aquatic resources that typically occur in the three physiographic provinces crossed by the proposed route are discussed below. The plant and animal species that are endangered or threatened are discussed in more detail in section 4.6. Common names for species are used below; a cross reference between common and scientific names is provided in table 4.5-1 at the end of section 4.5. The locations of the vegetative communities supporting the wildlife and aquatic resources discussed below are shown on maps in volume II.

4.5.1 Mojave Desert

4.5.1.1 Wildlife

Ruderal Communities

The wildlife species typically associated with the ruderal communities in the Mojave Desert are similar to the species associated with the natural communities discussed below. The larger mammals tend to avoid areas with extensive human activity. Most of the wildlife observed in ruderal areas is transient, i.e., using primarily adjacent natural lands as shelter and nesting habitat but ranging across ruderal land while foraging.

Agricultural Communities

The agricultural lands in the Mojave Desert have limited habitat value for the wildlife species in the adjacent natural communities discussed below.

Natural Communities — Mojave Desert Scrub

The mammalian species typically found in Mojave Desert scrub communities are coyote, badger, gray fox, black-tailed jackrabbit, desert cotton tail, Mojave ground squirrel, antelope squirrel, desert kangaroo rat, pocket mouse, deer mouse, and numerous species of bats. The typical birds are Gambel's quail, mourning dove, cactus wren, greater roadrunner, and common raven, and the raptors are golden eagle, prairie falcon, red-tailed hawk, and great horned owl. Reptiles are common and include striped whipsnake, coachwhip, sidewinder, Mojave rattlesnake, zebratail lizard, western whiptail, desert horned lizard, side-blotched lizard, and collared lizard.

4.5.1.2 Aquatic Resources

The proposed route does not cross waterbodies that support aquatic resources. It crosses only desert washes, which are dry most of the year. Because the flow is minimal, occurring only after it rains, aquatic ecosystems have not developed. The washes do, however, provide habitat for mammalian species.

4.5.2 Central Valley

4.5.2.1 Wildlife

Ruderal Communities

Ruderal communities are generally of low habitat value but support rodents and birds such as the northern mockingbird and mourning dove. Vegetation is either absent, horticultural landscaping, or weedy species. The more diverse vegetative structure in residential areas supports numerous species of birds and some mammals; however, the diversity and abundance of urban wildlife is limited by human activity, domestic animals, and other factors.

Agricultural Communities

Nearly 90 percent of the proposed right-of-way through the Central Valley is agricultural lands consisting of croplands, orchards, vineyards, and other highly modified habitats of generally low value to wildlife. These communities generally have low wildlife habitat value because of extensive and repeated ground disturbance, irrigation, use of agrochemicals, seasonal absence of cover, and unsuitable food supplies. The weedy edges of irrigation channels and poorly maintained orchards can be suitable habitats for some denning and nesting animals. Typical predators in agricultural areas are coyote, fox, badger, red-tailed hawk, Swainson's hawk, and northern harrier. Prey species include numerous small rodents such as harvest mice. The physical structure of orchards and vineyards and the fruit produced support a greater variety of birds such as sparrows, finches, and other passerines. Fallow agricultural fields undergoing secondary succession to nonnative grassland can support many of the same species but in generally reduced densities. Abandoned orchards and vineyards are also transitional communities and can be used as habitats by many species including small to medium-sized mammals, passerines, and raptors.

Natural Communities

Nonnative Grasslands — In the Central Valley, this community is present mainly along the southern 16.5 miles of the North Mainline but is also present in scattered areas along other portions of the North Mainline as well as the Sacramento Mainline, Coalinga and Tracy Segments, and Loop 4. Much of this habitat is grazed. The mammalian species typically found in nonnative grasslands are California ground squirrel, desert cottontail, black-tail jackrabbit, coyote, San Joaquin kit fox, badger, striped skunk, and various species of small rodents. Mule deer are also present in the southern Central Valley. Typical birds are American kestrel, northern harrier, red-tailed hawk, loggerhead shrike, burrowing owl, horned lark, and western meadowlark. Reptiles are abundant in the Central Valley and include gopher snake, western rattlesnake, western fence lizard, and other small reptiles. Because of the limited habitat, isolated tracts of nonnative grassland often have reduced species diversity and abundance, and many of the wildlife species using the nonnative grasslands also use neighboring communities.

Chenopod Scrub Communities — The portion of the Coalinga Segment between MP 48 and MP 51 and the portion of the North Mainline between MP 8 and MP 12 would cross chenopod scrub communities. The wildlife typically associated with these scrub habitats is similar to the wildlife associated with nonnative grasslands discussed above.

Wetlands — A diverse variety of **riparian woodlands** and **riparian scrub-shrub communities** were identified adjacent to streams at scattered locations along the proposed route during the biological surveys. Their structural diversity, high productivity, and proximity to water and aquatic habitats make these communities important to many species. Riparian habitats support badger, coyote, red fox, gray fox, western striped skunk, opossum, mice, voles, shrews, raccoon, mule deer, bats, western gray squirrel, and other small mammals. Numerous species of passerine birds occur including flycatchers, warblers, and woodpeckers, and several species of raptors nest and feed in riparian habitats including red-tailed hawks, American kestrels, and great-horned owls. Herons and egrets feed along riparian corridors and nesting colonies, or rookeries are often located in riparian woodland. Various species of reptiles and amphibians also occur including western rattlesnake, gopher snake, western fence lizard, southern alligator lizard, slender salamander, western pond turtle, pacific chorus frog, and western toad.

Riparian herbaceous communities were identified adjacent to several of the waterbodies crossed by the proposed route during the biological surveys. These communities provide important habitat for waterfowl, waders, great-blue heron, swallows, blackbirds, and some raptors. These areas are important habitat for amphibians but less so for mammals.

Seasonal wetlands provide habitats for a variety of species. During wetter periods, they provide habitat for species similar to those wetland species described above, and the standing water attracts migratory waterfowl and waders. During drier periods, they are used primarily by the species typical of adjacent grasslands as discussed above.

Vernal pools are depressions that collect rainwater as described in section 4.4.2.5. Because of hardpans beneath these pools, water loss is primarily by evaporation rather than infiltration. Vernal pools are sources of water for species in adjacent grassland communities, but specialized communities have developed that are specific to vernal pools. They are driven by the hydrologic input to the pools in that species have adapted to the seasonal variation in water levels and have life cycles that coincide with the presence of water in the pools. These vernal pool communities consist of a variety of amphibians such as California tiger salamander as well as many sensitive invertebrates such as vernal pool fairy shrimp and vernal pool tadpole shrimp. Table 4.4-1 listed the locations of vernal pools along the proposed route. Section 4.6 discusses in more detail the sensitive invertebrate and amphibian species associated with vernal pools.

Nonnatural ponding areas are similar to vernal pools in their use by wildlife. They are important sources of water for wildlife in adjacent habitats and provide habitat for invertebrate species with life cycles highly adapted to seasonal water availability. Several sensitive species have been found in these areas and are discussed in section 4.6.2.1.

4.5.2.2 Aquatic Resources

In the Central Valley, the North Mainline would cross 13 streams and canals in the San Joaquin River, Tulare Lake, and Sacramento River basins. Most are part of the Sacramento-San Joaquin River Delta drainage and generally contain similar fish species. Because of the arid climate of the Central Valley and diversions of surface water for agriculture, many of the streams are intermittent and so do not support fisheries. As the proposed route of the North Mainline approaches the Delta, the San Francisco Bay Area, and Sacramento, an increasing number of streams are encountered that support fisheries. Various warmwater species are found in streams crossed by the proposed route and typically include channel and white catfish, brown bullhead, crappie, sunfish, bluegill, largemouth and smallmouth bass, and American shad. The Delta also contains habitats important to a variety of anadromous and resident fish species. The anadromous game fish are chinook salmon, steelhead trout, striped bass, white sturgeon, and Pacific lamprey. The resident game fish are largemouth and smallmouth bass, white and black crappie, sunfish, bluegill, bullhead, and white catfish. Brackish-water species include the Pacific herring, longfin smelt, threadfin shad, Delta smelt, and starry flounder. Table 4.5.2.2-1 lists the fish species in the waterbodies crossed by the proposed route. In addition to fish, the waterbodies support numerous sensitive invertebrate and vertebrate species, which are discussed in section 4.6.

4.5.3 Coast Ranges - San Francisco Bay Area

4.5.3.1 Wildlife

Ruderal Communities

The species typically found in ruderal communities in the Coast Ranges-San Francisco Bay Area are generally those described in section 4.5.2.1 for the Central Valley.

Agricultural Communities

The wildlife species typically found in agricultural communities in the Coast Ranges-San Francisco Bay Area are generally similar to those found in the adjacent natural communities discussed below. Agricultural areas have limited habitat value because of extensive and repeated ground disturbance, irrigation, use of agrochemicals, seasonal absence of cover, and unsuitable food supplies.

Natural Communities

Nonnative Grasslands — The wildlife in nonnative grasslands is similar to that in the Central Valley as discussed in section 4.5.2.1 but also includes black-tailed deer and golden eagle.

Foothill Woodland Communities — The types of foothill woodland communities that occur along the proposed route are blue oak, valley oak, and mixed north slope cismontane oak woodland. These communities provide structurally diverse habitats and varied food supplies for a number of wildlife species including black-tailed deer, pronghorn antelope, gray squirrels, California ground squirrels, red fox, gray fox, striped skunk, opossum, and raccoon. Bird species include acorn woodpecker, band-tailed pigeon, scrub jay, California quail, California towhee, common bushtit, northern oriole, and black-headed grosbeak. Reptiles include western rattlesnake, common king snake, gopher snake, Gilbert's skink, western toad, and coast horned lizard. Amphibians include California newt.

Wetlands — The wildlife typically associated with **riparian woodland, riparian scrub-shrub, riparian herbaceous, and vernal pool communities** in the Coast Ranges-San Francisco Bay Area are generally those described for the Central Valley in section 4.5.2.1. **Alkali lowlands** support many of the same species found in adjacent nonnative grasslands and foothill woodlands described above. When alkali lowlands are flooded, waterfowl and shorebirds can also be present. **Coastal brackish marshes** are important habitats for many waterfowl, shorebirds, waders, and some passerine species. Mammalian and amphibian assemblages are well developed in freshwater and brackish-water marshes. Where the salinity approaches that of seawater, mammalian diversity is generally limited to salt-tolerant

TABLE 4.5.2.2-1

Fish Species in Surface Waters Crossed by the Proposed Route

Milepost a/	Water Body	Fish Species
CENTRAL VALLEY — NORTH MAINLINE		
25.2	Friant-Kern Canal	White catfish, Largemouth bass, Kern brook lamprey (Famoso Alternative)
57.5	South Branch of the Tule River	Largemouth bass, Bluegill, Crappie, Hitch (Famoso Alternative)
88.5/97.1	Kings River	Sacramento blackfish, Largemouth bass, Threadfin shad, California roach, Bluegill, Crappie, Hitch, Sacramento squawfish, Kern brook lamprey
121.7/130.2	San Joaquin River	Sacramento blackfish, Threadfin shad, California roach, Bluegill, Largemouth bass, Brown trout, Rainbow trout, Sacramento splittail, Kern brook lamprey
182.2/190.8	Merced River	Fall-run chinook salmon b/, Hitch, White sturgeon, Delta smelt, Sacramento squawfish, Golden shiner, Sacramento sucker, Brown bullhead, Carp, Largemouth bass, White catfish, Sacramento perch, Red-eared sunfish, Kern brook lamprey
203.3/212.0	Tuolumne River	Fall run Chinook Salmon, Hitch, White sturgeon, Delta smelt, Sacramento squawfish, Golden shiner, Sacramento sucker, Brown bullhead, Carp, Striped bass b/, White catfish, Sacramento perch, Red-eared sunfish
215.6/224.1	Stanislaus River	Hitch, White sturgeon, Sacramento squawfish, Golden shiner, Sacramento sucker, Brown bullhead, Carp, Largemouth bass, White catfish, Sacramento perch, Red-eared sunfish, Kern brook lamprey
222.1/230.6	San Joaquin River	Hitch, White sturgeon, Delta smelt, Sacramento squawfish, Golden shiner, Sacramento sucker, Brown bullhead, Carp, Largemouth bass, White catfish, Sacramento perch, Red-eared sunfish,
234.2/242.8	Delta Mendota Canal	Striped bass b/, Sturgeon, White catfish, Hitch, Sacramento splittail,
235.3/244.0	California Aqueduct	Striped bass b/, Sturgeon, White catfish, Hitch, Sacramento splittail
276.1/285.5	Contra Costa Canal	Channel catfish, White catfish, Striped bass,
287.7/296.6	Walnut Creek	Chinook salmon (rare) b/, Steelhead b/, Sacramento splittail, Channel catfish
288.3/297.2	Pacheco Creek	Chinook salmon (rare) b/, Steelhead b/, Sacramento splittail, Channel catfish
CENTRAL VALLEY — SACRAMENTO MAINLINE		
32.0/32.3	Mokelumme River	Largemouth bass, Hitch, White sturgeon, Golden shiner, Sacramento sucker, Brown bullhead, Carp, Red-eared sunfish
52.0	Cosummes River	Hitch, White sturgeon, Golden shiner, Sacramento sucker, Brown bullhead Carp, Red-eared sunfish
56.4	Laguna Creek	Bluegill, Largemouth bass, Smallmouth bass, Channel catfish, Brown bullhead
CENTRAL VALLEY - COALINGA SEGMENT		
25.3	Kings River	Hitch, Golden shiner, Sacramento sucker, Brown bullhead, Carp, Red-eared sunfish, Bluegill, Largemouth bass
37.5	California Aqueduct	Sacramento splittail, Striped bass b/, White catfish, Hitch
COAST RANGES AND SAN FRANCISCO BAY AREA — PALO ALTO SEGMENT		
13.6	Alameda Creek	Steelhead trout b/
28.3	Coyote Creek	Steelhead b/
32.4	Guadalupe River	Steelhead b/, Chinook salmon b/

---

a/ Pipeline segments not listed do not cross any waterbodies with identified fisheries.

b/ Anadromous.

rodents and opportunistic species such as racoons. Reptiles such as giant garter snake and western pond turtle are also found in freshwater to brackish-water marshes. Brackish marshes grade into salt marshes, which support a number of sensitive species including the California black rail, California clapper rail, salt marsh harvest mouse, salt marsh wandering shrew, and Suisun song sparrow. All of these species could range into brackish marshes.

4.5.3.2 Aquatic Resources

Within the San Francisco Bay Basin, fisheries habitats range from freshwater rivers, streams, and creeks to brackish-water marshes. Most of the streams crossed by the proposed route are dry at least half the year. In these ephemeral streams, the typical warmwater fish species are bluegill, largemouth bass, smallmouth bass, channel catfish, and brown bullhead. Species occurring in perennial streams range from anadromous steelhead trout to marine starry flounder. On the basis of existing fisheries data or, in the absence of fisheries data, extrapolating from hydrological data, the freshwater bodies that support viable fisheries are Alameda Creek, Coyote Creek, and the Guadalupe River. No viable fisheries occur in the brackish marshes crossed by the proposed route. In addition to these fishery resources, the waterbodies crossed by the proposed route support many other vertebrate and invertebrate species. Sensitive aquatic resources are discussed in section 4.6.

TABLE 4.5-1

Common and Scientific Names of Animals Potentially Occurring Along the Proposed Route

Common Name	Scientific Name
BIRDS	
Gambel's quail	*Callipepla gambelii*
Mourning dove	*Zenaida macroura*
Cactus wren	*Campylorhynchus brunneicappilus*
Greater roadrunner	*Geococcyx californianus*
Common raven	*Corvus corax*
Golden eagle	*Aquila chrysaetas*
Prairie falcon	*Falco mexicanus*
Red-tailed hawk	*Buteo jamaicensis*
Great horned owl	*Bubo virginianus*
Swanson's hawk	*Bueto swainsoni*
Northern harrier	*Circus cyaneus*
Finches	*Carpodacus* spp.
Northern mockingbird	*Mimus polyglottis*
American kestrel	*Falco sparverius*
Loggerhead shrike	*Speotyto cunicularia*
Horned lark	*Eremophila alpestris*
Western meadowlark	*Sturnella neglecta*
Flycatchers	*Empidonox* sp. (and others)
Acorn woodpecker	*Melanerpes formicivorus*
Band-tailed pigeon	*Columba fasciata*
Scrub jay	*Aphelocoma coerulescens*
California quail	*Lophortyx californicus*
California towhee	*Pipilo* sp.
Common bushtit	*Psaltriparus minimus*
MAMMALS	
Black-tailed jackrabbit	*Lepus californicus*
Desert cottontail	*Sylvilagus auduboni*
Antelope squirrel	*Ammonspermophilus* sp.
Desert kangaroo rat	*Dipodomys deserti*
Pocket mouse	*Perognathus* sp.
Deer mouse	*Peromyscus maniculata*
Harvest mouse	*Reithrodontomys* sp.
California ground squirrel	*Citellus beecheyi*
Striped skunk	*Mephitis mephitus*

TABLE 4.5-1 (cont'd)

Common Name	Scientific Name
Red fox	*Vulpes fulva*
Opposum	*Didelphis marsupialis*
Shrews	*Sorex* spp., *Cryphotoits* spp.
Raccoon	*Procyon lotor*
Western gray squirrel	*Sciurus griseus*
Salt marsh harvest mouse	*Reithrodontomys raviventris*
Mule deer (blacktail)	*Odocoileus hemionus*
REPTILES AND AMPHIBIANS	
Striped whipsnake	*Masticophis taeniatus*
Coach whip	*Masticophis flagellum*
Sidewinder	*Crotalus cerastes*
Mojave rattlesnake	*Crotalus scutulatus*
Western rattlesnake	*Crotalus viridis*
Zebratail lizard	*Callisaurus draconoides*
Western whiptail	*Cnemidophorus tigris*
Desert horned lizard	*Phrynosoma platyrhinos*
Side-blotched lizard	*Uta stansburiana*
Collared lizard	*Crotaphytus collaris*
Gopher snake	*Pituophis melanoleucus*
Western fence lizard	*Sceloporus occidentalis*
Southern alligator lizard	*Gerrhonotus multicarinatus*
Slender salamander	*Batrachoseps* sp.
Western pond turtle	*Clemmys marmorata*
Western toad	*Bufo boreas*
Common king snake	*Lampropeltis getulus*
Gilbert's skink	*Eumeces gilberti*
California newt	*Taricha torosa*
Coast horned lizard	*Phrynosoma coronatum*
Pacific tree frog	*Hyla regilla*
FISH	
White crappie	*Poxomis annularis*
Black crappie	*P. nigromaculatus*
Brown bullhead	*Ictalurus nebulosus*
Bluegill	*Lepomis macrochirus*
Largemouth bass	*Micropterus salmoides*

TABLE 4.5-1 (cont'd)

Common Name	Scientific Name
Smallmouth bass	*M. dolomieui*
American shad	*Alosa sapidissima*
Steelhead trout	*Oncorhynchus mykiss gairdneri*
White sturgeon	*Acipenser transmontanus*
Pacific lamprey	*Entosphenus tridentatus*
White catfish	*Ictalurus catus*
Longfin smelt	*Spirichus thaleichthys*
Threadfin shad	*Dorosoma tetenense*
Delta smelt	*Hypomesus transpacificus*
Striped bass	*Morone saxatilis*
Golden shiner	*Notemigonus crysoleucas*
Sacramento squawfish	*Ptychocheilus grandis*
Sacramento blackfish	*Orthodon microlepidotus*
Sacramento perch	*Archoplites interruptus*
Red-ear sunfish	*Lepomis microlophus*
Brown trout	*Salmo trutta*
Hitch	*Lavinia exilicauda*
Sacramento sucker	*Catostomus occidentalis*
Black bullhead	*Ictalurus melas*
Carp	*Cyprinus carpio*

4.6 SPECIAL STATUS SPECIES

To comply with requirements of the Federal and California Endangered Species Acts as well as CEQA, FERC and SLC have informally consulted with the FWS and the DFG to identify special status species potentially affected by the project. The appropriate BLM district offices were consulted regarding the presence of sensitive species on Federal lands crossed by the proposed route. During 1993 and 1994, Mojave conducted field surveys for sensitive and other special-status species. The results of these surveys are contained in Mojave's Revised Biological Resources Survey Report dated July 1994 (Revised Survey Report). The areas that would be affected by Loops 1, 2, and 3 were surveyed for the construction of the existing Mojave Mainline. Those survey findings and the results of field surveys for the Amboy and Daggett Compressor Stations have been incorporated into the Revised Survey Report.

On the basis of agency consultations and review of existing data, 92 special-status species have the potential of being affected and were addressed during the field surveys, 36 animal species and 56 plant species. Of the 35 animal species, 16 are listed as threatened or endangered by the FWS or DFG, and another two are proposed for listing as endangered. The remaining 18 animal species are candidates for Federal listing or species of special concern by the state. Federal threatened or endangered status has been given to nine of the 57 plant species, and another six are currently proposed for listing as endangered. The remaining 38 plant species are candidates for Federal listing, state-listed species, or species listed by the California Native Plant Society (Lists 1A, 1B and 2) by the California Native Plant Society. Of the 92 species addressed during the field surveys and listed in table 4.6-1 at the end of section 4.6, 35 were documented by observation of either occupied or potential habitat along the route and have the potential to be affected by the project. These 35 species are summarized in table 4.6-2 at the end of section 4.6 and discussed below by physiographic province. Potential habitat for threatened or endangered species is also shown on the maps in volume II.

4.6.1 Mojave Desert

4.6.1.1 Animal Species

Mojave Ground Squirrel (*Spermophilus mohavensis*)

The Mojave ground squirrel is a Federal-listed Category 2 species and state-listed as threatened. It occupies Mojave Desert scrub and Joshua tree woodland that is dominated by creosote bush, Joshua tree, or shadscale. The squirrel occurs in the western Mojave Desert in southwestern Inyo County, eastern Kern County, and northwestern San Bernardino County but potentially occurs in the project area only along the proposed Loop 3 route from MP 1 to MP 23. Two sightings were confirmed near the proposed right-of-way during pre-construction and construction monitoring of the original Mojave pipeline.

Burrowing Owl (*Athene cunicularia*)

The burrowing owl is a California species of concern that inhabits open, dry, and nearly level grasslands, fallow fields, and desert communities. Burrowing owls primarily use ground squirrels burrows and have adapted to moderate levels of human disturbance. It can be found along edges of fields, ditch banks, and roads. Potential burrowing owl habitat exists along the entire route.

Desert Tortoise (*Gopherus agassizii*)

The desert tortoise is state and federally listed as threatened. This species occurs in eastern Kern County, southeastern Inyo County, and over most of San Bernardino County. It inhabits washes, rocky hillsides, and flat desert having sandy or gravelly soil and creosote bush, burrobush, saltbush, or Joshua tree vegetation. Mojave yucca and cacti are often present in the habitat along with other shrubs, grasses, and wildflowers. Loop 1 from MP 0.0 to MP 10 crosses an area designated as critical desert tortoise habitat by the BLM and FWS. The remainder of Loop 1, all of Loop 2, and the eastern half of Loop 3 cross areas designated as BLM Category 3 habitat. The western half of Loop 3 crosses an area designated as BLM Category 1 and FWS critical habitat. A total of 78 tortoises were observed on Loops 1, 2, and 3.

4.6.1.2 Plant Species

Mojave Eriophyllum (*Eriophyllum mohavense*)

This woolly, dwarf, annual herb about 0.4 to 1 inch tall is in the sunflower family (Asteraceae). It is a Federal Category 2 candidate. It flowers from April to May and occurs in chaparral scrub, Mojave desert scrub, and playa habitats 1,600 to 2,600 feet above mean sea level (MSL). Mojave eriophyllum occurs in San Bernardino County and is threatened by energy development, road improvements, vehicles, and grazing. Eleven populations were observed during field surveys in or adjacent to the proposed Loop 3 right-of-way between MP 10 and MP 12.

Foxtail Cactus (*Coryphantha vivipara var. alversonii*)

Foxtail cactus is a Federal Category 2 candidate. It is a cylindrically shaped, unbranched, desert shrub that flowers from May to June and occurs on sandy to rocky soils in Mojave and Sonoran desert shrub habitats above about 4,900 feet. Foxtail cactus occurs in Imperial, Riverside, and San Bernardino Counties. One population of foxtail cactus with 85 individuals was observed along Loop 2 between MP 35 and MP 36 during preconstruction surveys for the existing Mojave Mainline.

4.6.2 Central Valley

4.6.2.1 Animal Species

San Joaquin Kit Fox (*Vulpes macrotis mitica*)

The San Joaquin kit fox is a Federal-listed endangered and California-listed threatened species. It inhabits annual grassland, salt bush scrub, and alkali sink communities containing annual grasses in the western San Joaquin Valley and in Tulare and Kern Counties on the eastern side of the valley. Kit foxes typically construct dens on flat or sloping terrain, on moderately sloping hillsides, and along ridges, wash banks, and road berms. It is known to forage in fallow agricultural fields. The historic distribution of this species was from San Joaquin and Stanislaus Counties south to Kern County. On the basis of the field surveys, potential kit fox habitat occurs along the North Mainline south of MP 89/97 and between MP 233/241 and MP 275/284, between MP 11 and MP 25 of Loop 4, between MP 0 and MP 51 of the Coalinga Segment, between MP 0 and MP 7 of the Lathrop Segment, between MP 0 and MP 17 of the Lindsay Segment, between MP 7 and MP 28 of the Palo Alto Segment, and between MP 0 and MP 4 of the Oakland Segment. Confirmed sightings occurred between MP 8 and

MP 10 on the North Mainline, between MP 48 and MP 49 on the Coalinga Segment, and between MP 15 and MP 22 on Loop 4.

Tipton Kangaroo Rat (*Dipodomys nitratoides notratoides*)

The Tipton kangaroo rat is a Federal- and state-listed endangered species that inhabits saltbush scrub and alkali sink scrub communities in the Tulare Lake Basin of the southern San Joaquin Valley in Kern, Tulare, and Kings Counties. It can also inhabit fallow or abandoned agricultural fields, grasslands, road berms, and railroad beds. On the basis of the field surveys, a small area (less than 0.1 mile) of disturbed occupied habitat is present between MP 47 and MP 48 on the North Mainline (Famoso Alternative).

Short-Nosed Kangaroo Rat (*Dipodomys nitratoides brevinasus*)

The short-nose kangaroo rat is a Federal Category 2 and state species of concern. It is found on mostly flat and sloping terrain and on hilltops in desert shrub communities and occurs on the western side of the San Joaquin Valley south of approximately Los Banos and west of the San Joaquin River in a line coinciding with the Kettleman Hills, Lost Hills, and Elk Hills to the south end of the valley. They also occur in the Panoche Valley, San Benito County, the Antelope Plain in Kern County, and at the edge of the valley floor around the south end of the San Joaquin Valley from the vicinity of Maricopa on the west to Bakersfield on the east. Wherever they are found, they are typically abundant. The first field surveys found potential short-nosed kangaroo rat habitat along the Coalinga Segment from MP 47 to MP 52. In subsequent verification trapping, 16 individuals were captured.

Swainson's Hawk (*Buteo swainsoni*)

Swainson's hawk is a state-listed threatened species. It prefers riparian areas adjacent to or near alfalfa, hay, or wheat fields that support rodent populations. The hawk nests in open riparian areas containing numerous large valley oaks and occasional cottonwoods or sycamores. It once commonly nested throughout the Sacramento and San Joaquin Valleys and also bred in the Salinas and Santa Clara Valleys and some of the larger mountain meadows in the Sierra Nevada. Only a few pairs remain in the San Joaquin Valley, and most of these are from Merced County north. It is extremely rare in the southern San Joaquin Valley. A nest at Mendota Pool in the summer of 1978 was one of the few located in recent years in Fresno County. The largest known population remaining in the state is in the Davis-Woodland-Sacramento area of the Sacramento Valley. Raptor surveys conducted during 1993 and 1994 reported 14 sightings on the North Mainline. Seventy-five individuals were observed on the Sacramento Mainline, including one population of 50-60 individuals foraging in a field. Based on field surveys, potential nesting habitat exists on the Sacramento Mainline between MP 0.0 and MP 69, the Tracy Segment between MP 0.0 and MP 6, the Lathrop Segment between MP 0.0 and MP 9, and the Ripon Segment between MP 0.0 and MP 2. Along the North Mainline between MP 56 and MP 65, and between MP 156/165 and MP 238/249, potential nesting habitat occurs in Merced, Stanislaus, San Joaquin, Alameda, and southeastern Tulare Counties.

Burrowing Owl (*Athene cunicularia*)

The burrowing owl is a California species of concern that inhabits open, dry, and nearly level grasslands, fallow fields, and desert communities. Burrowing owls primarily use ground squirrels burrows and have adapted to moderate levels of human disturbance. It can be found along edges of fields, ditch banks, and roads. The CNDDB cites at least 34 occurrences of the burrowing owl within

5 miles of the proposed route, primarily in the Coast Ranges and southern San Francisco Bay Area and near the north end of the Sacramento Mainline. Potential burrowing owl habitat exists along the entire route. Burrowing owl were observed between MP 56 and MP 57 on Sacramento Mainline.

Blunt-Nosed Leopard Lizard (*Gambelia silus*)

The blunt-nosed leopard lizard is a Federal- and state-listed endangered species that inhabits sparsely vegetated alkali and desert scrub communities with low topographic relief. It seeks cover in mammal burrows or under shrubs, fence posts, and other structures. Its optimum habitat appears to be grasslands with alkali soils and open scalds with some relief. Steep or rocky slopes, cultivated fields, seasonally flooded areas, and dense shrub are not suitable habitat. On the basis of the field surveys, occupied habitat is present between MP 8 and MP 11 of the North Mainline, between MP 48 and MP 51 of the Coalinga Segment, and between MP 15 and MP 22 of Loop 4.

Giant Garter Snake (*Thamnophis couchi gigas*)

The giant garter snake is a Federal proposed endangered and state-listed threatened species. It inhabits marshes and shallow sloped river channels with emergent vegetation and associated grassy uplands in the San Joaquin Valley. Giant garter snakes are aquatic and primarily active during the day although they may forage during early evening hours on warm days. Their live young are born in late summer. Because the giant garter snake is secretive and difficult to survey, the California Natural Diversity Database (CNDDB) and habitat characterization were used to assess potential habitat. Within the project area, this species potentially occurs in marshy and perennial stream areas. Additionally, the CNDDB cites an occurrence of the giant garter snake on Laguna Creek near MP 6.0 of the Sacramento Mainline. Suitable habitat is found at all river crossings in the Central Valley.

Vernal Pool Fairy Shrimp (*Branchinecta lynchi*)

The vernal pool fairy shrimp is a Federal-listed threatened species. It occurs in the Central Valley, potentially everywhere in the project area where vernal pools, sandstone outcrop pools, or non-natural ponding areas are present. It completes its life cycle during the winter and spring months when standing water is present. Suitable habitat occurs in isolated locations along 13 miles of the North Mainline (between MP 81/90 and MP 83/92 and between MP 134/143 and MP 145/154) and for approximately 44 miles of the Sacramento Mainline (between MP 7 and MP 45 and in a single pool located between MP 58 and MP 59), and between MP 1 and MP 7 on the Sacramento (A-159) segment. Additional potential habitat is found in non-natural ponding areas scattered through out 35 miles of the North Mainline (between MP 128/137 and MP 163/172) and 14 miles of the Sacramento line (between MP 43 and MP 57). Fairy shrimp were observed between MP 44 and MP 45 and between MP 57 and MP 58 on the Sacramento Mainline and between MP 137/146 and MP 138/147 on North Mainline.

Vernal Pool Tadpole Shrimp (*Lepidurus packardi*)

The vernal pool tadpole shrimp is a Federal-listed endangered species that occurs in the Central Valley and potentially in the project area anywhere vernal pools are present. Eggs are deposited on the floor of a pool in spring and hatch shortly after the pool fills in December or January. Adults may survive until April but usually disappear before the pool is completely dry. Confirmed sightings of tadpole shrimp occurred between MP 54 and MP 59 on the Sacramento Mainline and between MP 81/90 and MP 82/91 on the North Mainline.

Valley Elderberry Longhorn Beetle *(Desmocerus californicus dimorphus)*

The valley elderberry longhorn beetle is a Federal-listed threatened species that occurs only in the Central Valley associated with blue elderberry. It potentially occurs in the project area within or close to stream riparian habitats from Fresno County north to Sacramento wherever blue elderberries occur. Suitable habitat was observed at various locations between MP 23 and MP 50 on the proposed Sacramento Mainline, near MP 89/97, MP 181/189, and MP 202/211 on the North Mainline, and near MP 20, MP 21, and MP 25 on the Coalinga Segment. No occupied habitat was observed during field surveys.

4.6.2.2 Plant Species

Hoover's Wooly Star *(Eriastrum hooveri)*

Hoover's wooly star is listed as threatened by the Federal government but not listed by the state. It is associated with the grassland component of the valley saltbush scrub community. The most extant populations are in western Kern County, but several historical populations are known from the Bakersfield and Oildale areas. Recent botanical surveys along the California Aqueduct have led to the discovery of a number of new populations of Hoover's wooly star and a re-evaluation of its threatened status (CNPS, 1993). The latest edition of the "Inventory of Rare and Endangered Vascular Plants of California" downlists Hoover's wooly star from endangered (List 1B) to limited distribution (List 4). A population of Hoover's wooly star was discovered during the field surveys in southern Fresno County between MP 49 and MP 50 of the Coalinga Segment.

Recurved Larkspur *(Delphinium recurvatum)*

Recurved larkspur is a Federal Category 2 candidate. It typically occurs in valley sink scrub communities but may also occur in the grassland component of valley saltbush scrub communities and in nonnative grasslands. There are numerous records of recurved larkspur on the floor of the San Joaquin Valley from southern Tulare County through Kern County. The species is also known to occur in alkali sink areas in the Coast Ranges. The CNDDB reports three populations of recurved larkspur near the proposed North Mainline in southern Tulare County and another population about 4 miles east of MP 255/264 on the North Mainline in Contra Costa County. A previously undocumented population of recurved larkspur was found between MP 3 and MP 4 of the Coalinga Segment on March 28, 1993. The population consisted of more than 40 individual plants in previously disturbed nonnative grassland. A portion of the population occurs within the proposed construction right-of-way.

Brittlescale *(Atriplex depressa)*

Brittlescale is a Federal Category 2 candidate. It is an annual atriplex that grows in alkali sink scrub communities and flowers from June through October. Little is known about the current status and distribution of this species. A population of brittlescale was also discovered from MP 81/90 to MP 82/91 of the North Mainline in Tulare County during the 1994 field survey. This population consisted of more than 2,000 individuals and extended at least 200 feet east of the proposed construction right-of-way with at least 500 plants in the right-of-way.

Valley Spearscale *(Atriplex joaquiniana)*

Valley spearscale is a Federal Category 2 candidate. It can be found in alkali sink scrub communities in the Central Valley. It flowers from April through September. Valley spearscale was not identified during the field surveys in the Central Valley. Populations were observed in the Coast Range, see Section 4.6.3.

Bakersfield Cactus (*Opuntia trelcasei*)

Bakersfield cactus is a state and Federal-listed endangered species. It is a succulent, spiny member of the cactus family (Cactaceae) with large, showy megenta flowers that bloom from March through June. It is a spreading perennial plant with gray-green stems which form flat joints (pads). This species grows on coarse, cobbly, well-drained granitic sand on bluffs, low hills, and flats within the chenopod scrub, valley, and foothill grasslands of Kern County. No Bakersfield cactus populations were observed along the Northward Expansion alignments during the 1993 or 1994 field surveys. Suitable habitat occurs along Poso Creek between MP 8 and MP 11 on the North Mainline. A large Bakersfield cactus was observed on Loop 4 between MP 11 and MP 12 and another from MP 24 and MP 25.

Spiny-Sepaled Button Celery (*Eryngium spinosepalum*)

This species is a Federal Category 2 candidiate. It is found in vernal pools along the east side of the San Joaquin Valley. Most of the known sites are found in northern hardpan vernal pools and swales along the edge of the valley floor and into the foothills of the Sierra Nevada from Tulare, Fresno, Madera, and Merced Counties. The CNDDB shows no record of occurrence within 5 miles of the proposed alignment. Spiny-sepaled button celery was not observed during the habitat characterization surveys nor during focused field surveys in vernal pool habitat in 1993. Spiney-sepaled button celery was found in the vernal pools between MP 189/198 and MP 190/199 on the North Mainline on June 22, 1994. The largest number of plants (approximately 100) was found in the middle pool and only a few plants were found in the pools to the north and south.

4.6.3 Coast Ranges - San Francisco Bay Area

4.6.3.1 Animal Species

San Joaquin Kit Fox (*Vulpes macrotis mitica*)

The San Joaquin kit fox is a Federal-listed endangered and California-listed threatened species. Wildlife agencies have indicated that the kit fox occurs in foothill grasslands and adjacent agricultural lands in Alameda and Contra Costa Counties. Potential kit fox habitat is found between MP 233/241 and MP 275/284 of the North Mainline and from MP 7 to MP 28 of the Palo Alto Segment.

Burrowing Owl (*Athene cunicularia*)

The burrowing owl is a California species of concern that inhabits open, dry, and nearly level grasslands, fallow fields, and desert communities. Burrowing owls primarily use ground squirrels burrows and have adapted to moderate levels of human disturbance. It can be found along edges of fields, ditch banks, and roads. The CNDDB cites at least 34 occurrences of the burrowing owl within 5 miles of the proposed route, primarily in the Coast Ranges and southern San Francisco Bay Area and near the north end of the Sacramento Mainline. Potential burrowing owl habitat exists along the entire route. Burrowing owl were observed between MP 235/241 and MP 241/247 on the North Mainline.

Golden Eagle *(Aquila chrysaetos)*

The golden eagle is a state species of special concern. It inhabits rolling foothills and Coast Range terrain where open grasslands change to scattered oaks, sycamores, or large digger pines. The golden eagle nests in cliff-walled canyons and large trees in open areas. In 1993, golden eagles were observed between MP 13 and MP 14 of the Sacramento Mainline and between MP 233/239 and MP 265/274 of the North Mainline. No nests were observed from the route, but suitable nesting habitat is present.

Double-Crested Cormorant *(Phalacrocorax auritus)*

The double-crested cormorant is a state species of special concern. It nests along the coast on sequestered islets, usually on sloping ground, or in tall trees along lake margins throughout California. The double-crested cormorant historically bred in both the Sacramento and San Joaquin Valleys. Double-crested cormorants were observed foraging on the lower reaches of the San Joaquin River, and a potential nesting colony was observed in Shell Marsh near MP 290/299 at the northern end of the North Mainline. A flock of about 22 birds was observed roosting on bunchgrass mats in the center of the marsh during the 1993 field surveys. A flock of cormorant was observed between MP 221/230 and MP 222/231 on the North Mainline at the San Joaquin River crossing.

Suisun Song Sparrow *(Melospiza melodia maxillaris)*

The Suisun song sparrow is Federal Category 2 candidate and a state species of special concern. It inhabits cattails, tules, and other sedges in brackish marshes around Suisun Bay. There are 12 CNDDB occurrence records for the Suisun song sparrow within 5 miles of the North Mainline. Numerous Suisun song sparrows were observed during the 1993 field surveys in the brackish marshes along portions of the North Mainline in northern Contra Costa County. Numerous sightings of Suisun song sparrow were observed between MP 285/294 and MP 290/299 of the North Mainline, and between MP 0 and MP 1 of the Martinez Segment. Potential habitat is found in the coastal salt and brackish marsh communities anywhere they occur along the proposed route.

Western Pond Turtle *(Clemmys marmorata ssp.)*

The western pond turtle is a Federal Category 1 candidate and state species of special concern. It inhabits permanent or nearly permanent bodies of water in a variety of habitats below 6,000 feet above sea level. Suitable habitats include all rivers with water for at least 6 months. It requires basking sites such as partially submerged logs, vegetation mats, or unvegetated shoreline. The subspecies *C. m. marmorata* occurs from British Columbia to San Francisco Bay. The subspecies *C. m. pallida* occurs from south San Francisco Bay to northwestern Baja California. The distributions of the two subspecies overlap in the project area in the San Francisco Bay Area and Central Valley. Eggs are laid from April to August and hatch about 12 weeks later. Occupied habitat was observed during the field surveys between MP 3 and MP 4 of the Antioch Segment and on the North Mainline between MP 209/217 and MP 210/218.

San Francisco Garter Snake *(Thamnophis sirtalis tetrataenia)*

The San Francisco garter snake is a Federal- and state-listed endangered species that now occurs only at about 30 sites in San Mateo County and extreme north Santa Cruz County. Its preferred habitat is a densely vegetated pond near a hillside where it can sun itself, feed, and find cover in rodent burrows. The snakes are extremely shy, difficult to locate and capture, and quickly flee to water or cover when disturbed. The CNDDB reports an occurrence in October 1990 in the Loma Alta Canal near MP 18 of the Hunters Point Segment.

Alameda Whipsnake (*Masticophis lateralis euryxanthus*)

The Alameda whipsnake is a Federal Category 1 candidate and a state-listed threatened species. It inhabits eastern San Francisco Bay Area valleys, foothills, and low mountains in ecotonal areas of dry coastal scrub habitat with grassland, oak woodland, or riparian vegetation. It is common around water bodies and mates in the spring. Its eggs are laid from May to July and hatch from August to October. Suitable habitat may exist in two areas of dense oak woodland identified north of the west side of Kellogg Creek along the North Mainline between MP 257/266 and MP 258/267.

California Tiger Salamander (*Ambystoma californiense*)

The California tiger salamander is a Federal Category 2 candidate and a California species of special concern. Its range is restricted to the Central Valley and coastal valleys of California from Tulare County to Butte County. It is associated with annual grasslands and the grassy understories of valley/foothill hardwood communities and requires burrows or underground refuges as well as vernal pools, freshwater marshes, or seasonal water sources for breeding. Based on CNDDB records and habitat evaluation, suitable tiger salamander habitat occurs at scattered locations between MP 236/242 and MP 276/285 of the North Mainline and from MP 7 to MP 28 of the Palo Alto Segment. Salamander larvae were observed in a cattle pond between MP 255/264 and MP 256/265 on the North Mainline. Potential habitat was also observed in two pools in the North Mainline right-of-way between MP 256/165 and MP 257/266 and between MP 275/284 and MP 276/285 and in a cattle pond between MP 58 and MP 59 on the Sacramento Mainline.

California Red-Legged Frog *(Rana aurora draytoni)*

The California red-legged frog is a federally proposed endangered species and a California species of special concern. It is found in streams and ponds with dense emergent vegetation such as tules and cattails along the shoreline. Historically, this species was found throughout the Central Valley and Sierra Nevada foothills. It has virtually disappeared from the valley and most of the foothills; however, populations remain in the Coast Ranges. No evidence of California red-legged frog was found during the 1993 field surveys although potential habitat was observed at several locations throughout the Coast Ranges at riparian crossings on the North Mainline from MP 233/239 to MP 278/287. During the 1994 field surveys, occupied habitat was observed near Kellogg Creek on the North Mainline between MP 257/266 and MP 258/267.

Longhorn Fairy Shrimp (*Branchineta longiantenna*)

The longhorn fairy shrimp is a Federal-listed endangered species. It is generally found in two different types of vernal pools: clear to moderately turbid, clay- or grass-bottomed vernal pools in nonnative grasslands and small, clear-water-filled depressions in sandstone formations. Suitable habitat for longhorn fairy shrimp has been documented in vernal pools in Contra Costa County on the North Mainline near MP 255/264.

4.6.3.2 Plant Species

Heartscale (*Apriplex cordulata*)

Heartscale is a Federal Category 2 candidate that grows in alkaline soils in non-native grasslands and alkali sink scub communities. It flowers from April through September. A population of approximately 20 individuals was observed between MP 249/258 and MP 250/259 on the North Mainline. Potential habitat exists in previously inaccessible alkali lowland habitat within the Coast Ranges.

Palmate-Bracted Bird's Beak (*Cordylandthus palmatus*)

The palmate-bracted bird's beak is both a Federal- and state-listed endangered species. It is most commonly associated with alkali sink/meadow but may also be found in other chenopod scrub communities. No potential habitat for this species was found in the accessible alkali lowlands during the field surveys, but potential habitat may occur along the North Mainline from MP 247/256 to MP 264/273 in Alameda and Contra Costa Counties.

Large-Flowered Fiddleneck (*Amsinckia grandiflora*)

The large-flowered fiddleneck is listed as endangered by both Federal and state agencies. It is found in nonnative grassland and the grassland component of oak woodland/chaparral communities. Two known populations exist, one near the Lawrence Livermore Laboratory in eastern Alameda County and one in San Joaquin County. No populations of large-flowered fiddleneck were discovered during the field surveys, but potential habitat exists in unsurveyed areas on the proposed North Mainline between MP 247/256 and MP 276/285 and Palo Alto Segment between MP 9 and MP 28.

Santa Cruz Tarplant (*Holocarpha Macradenia*)

The Santa Cruz tarplant is listed as endangered by the state and a Federal Category 1 candidate species. It is found in heavy soils on grassy flats in nonnative grassland communities from Monterey County north through Contra Costa County. Populations are known from the Briones Valley and the foothills near Richmond, and potential habitat occurs in the nonnative grasslands described above for the large-flowered fiddleneck. According to the CNDDB, no records exist of historic or extant occurrences within 5 miles of the proposed route, but potential habitat may exist along MP 247/256 to MP 276/285 of the North Mainline and from MP 9 to MP 28 of the Palo Alto Segment.

Antioch Dunes Evening Primrose (*Oenthera deltoides howelii*)

This evening primrose is found only in the sand dunes along the south bank of the San Joaquin River near Antioch. It is both a Federal- and state-listed endangered species. The CNDDB reported an occurrence 0.2 mile northwest of MP 2.7 of the Antioch Segment, which would be adjacent to the Antioch Dunes Ecological Reserve where a flowering evening primrose was observed. Evening primrose was also observed between MP 4 and MP 5 of the Antioch Segment.

Contra Costa Wallflower (*Erysimum capitatum angustatum*)

The Contra Costa wallflower is listed as a Federal and state endangered species. It is only found in sand dunes along the San Joaquin River east of Antioch. CNDDB records do not indicate any occurrence within 2 miles of the proposed route. Suitable habitat is known to occur from MP 4 to MP 5 of the Antioch Segment.

Brittlescale *(Atriplex depressa)*

Brittlescale is a Federal Category 2 candidate. It is an annual atriplex that grows in alkali sink scrub communities and flowers from June through October. Little is known about the current status and distribution of this species. On the basis of field surveys for the Los Vaqueros project, several populations of brittlescale appear to be located near Kellogg Creek on the North Mainline. Alkali lowland habitat suitable for brittlescale was also found from MP 247/256 to MP 264/273 of the North Mainline. Potential habitat also exists within areas previously inaccessible for survey along the North Mainline.

Valley Spearscale *(Atriplex joaquiniana)*

Valley spearscale is a Federal Category 2 candidate. It is found in alkali sink scrub communities in the Coast Ranges. It flowers from April through September. Pipeline construction could disrupt at least four populations of Valley spearscale in the Coast Ranges, for it would be difficult to avoid populations by realigning the pipeline through this area because the populations cover wide areas and intergrade along the creek drainages throughout the Coast Ranges. Suitable habitat for Valley spearscale occurs from MP 247/256 to MP 264/273 of the North Mainline. Valley spearscale was observed between MP 249/258 and MP 250/259 and near MP 284/293 and MP 286/295 along the North Mainline. Potential habitat also exists within previously inaccessible areas of the North Mainline.

TABLE 4.6-1

Sensitive Plant and Wildlife Species Addressed by Field Surveys

Common Name	Scientific Name	Status Federal	 State
Mammals			
San Joaquin Antelope Squirrel	*Ammospermophilus nelsoni*	C2	T
Fresno Kangaroo Rat	*Dipodomys nitratoides exillis*	E	E
Tipton Kangaroo Rat	*Dipodomys nitratoides notratoides*	E	E
Giant Kangaroo Rat	*Dipodomys ingens*	E	E
Short-nosed Kangaroo Rat	*Dipodomys nitratoides brevinasus*	C2	CSC
Mojave Ground Squirrel	*Spermophilus mohavensis*	C2	T
San Joaquin Kit Fox	*Vulpes macrotis mutica*	E	T
Birds			
Tricolored Blackbird	*Agelaius tricolor*	C2	CSC
Golden Eagle	*Aquila chrysaetos*	–	CSC
Short-Eared Owl	*Asio flammeus*	--	CSC
Burrowing Owl	*Athene cunicularia*	–	CSC
Swainson's Hawk	*Buteo swainsoni*	C3	T
Western Snowy Plover	*Charadrius alexandrinus nivosus*	T	CSC
Western Yellow Billed Cuckoo	*Coccyzus americanus occidentalis*	–	E
Yellow-breasted Chat	*Icteria virens*	–	CSC
Suisun Song Sparrow	*Melospiza melodia maxillaris*	C2	CSC
Double-crested Cormorant	*Phalacrocorax auritus*	–	CSC
White-faced Ibis	*Plegadis chihi*	C2	CSC
California Least Tern	*Sterna antillarum browni*	E	E
Le Contes' Thrasher	*Toxostoma lecontei*	--	CSC
Amphibians			
California Tiger Salamander	*Ambystoma tigrinum californiense*	PE	CSC
California Red-legged Frog	*Rana aurora draytoni*	PE	CSC
Foothill Yellow-legged Frog	*Rana boylii*	C2	CSC
Reptiles			
Western Pond Turtle	*Clemmys marmorata* ssp.	C1	CSC
Blunt-nosed Leopard Lizard	*Gambelia silus*	E	E
Desert Tortoise	*Gopherus agassizii*	T	T
Alameda Whipsnake	*Masticophis lateralis euryxanthus*	C1	T

TABLE 4.6-1 (cont'd)

Common Name	Scientific Name	Status Federal	 State
Invertebrates			
Longhorn Fairy Shrimp	*Branchinecta longiantenna*	E	–
Vernal Pool Fairy Shrimp	*Branchinecta lynchi*	T	–
Valley Elderberry Longhorn Beetle	*Desmocerus californicus dimorphus*	T	–
Bay Checkerspot Butterfly	*Euphydryas editha bayensis*	T	–
Mission Blue Butterfly	*Icaricia icarioides missionensis*	E	–
San Bruno Elfin Butterfly	*Incisalia mossii bayensis*	E	–
San Francisco Forktail Damselfly	*Ischnura gemina*	C2	–
Vernal Pool Tadpole Shrimp	*Lepidurus packardi*	E	–
California Linderiella	*Linderiella occidentalis*	PE a/	–
Plants			
Henderson's Bentgrass	*Agrostis microphylla hendersonii*	C2	CNPS 3, RED 3-2-2
Forked Fiddleneck	*Amsinckia furcata*	C2	CNPS 4, RED 1,2,3
Large-Flowered Fiddleneck	*Amsinckia grandiflora*	E	E, CNPS 1A, RED 3-3-3
Suisun Aster	*Aster chilensis var lentus*	C2	CNPS 1B, RED 2-2-3
Lost Hills Saltbush	*Atriplex vallicola*	C2	CNPS 1B, RED 2-2-3
Bakersfield Saltbush	*Atriplex tularensis*	C2	E, CNPS 1B, RED 3-3-3
Heartscale	*Atriplex cordulata*	C2	CNPS 1B, RED 2-2-3
Brittlescale	*Atriplex depressa*	C2	CNPS 1B, RED 3-3-2
Valley Spearscale	*Atriplex joaquinanna*	C2	CNPS 1B, RED 2-2-3
California Jewelflower	*Caulanthus californicus*	E	E, CNPS 1B, RED 3-3-3
Hoover's Spurge	*Chamaesyce hooveri*	PT	CNPS 1B, RED 3-2-3
Slough Thistle	*Cirsium crassicaule*	C2	CNPS 1B, RED 3-2-3
Hispid Bird's-Beak	*Cordylanthus mollis ssp hispidus*	C2	CNPS 1B, RED 2-3-3
Soft Bird's-Beak	*Cordylanthus mollis ssp mollis*	C1	R, CNPS 1B, RED 3-2-3

TABLE 4.6-1 (cont'd)

Common Name	Scientific Name	Status	
		Federal	State
Palmate-Bracted Bird's-Beak	*Cordylanthus palmatus*	E	E, CNPS 1B, RED 3-3-3
Foxtail Cactus	*Coryphantha vivipara var. alversonii*	C2	CNPS 1B, RED 2-2-2
Desert Cymopterus	*Cymopterus deserticola*	C1	CNPS 1B, RED 3-2-3
Recurved Larkspur	*Delphinium recurvatum*	C2	CNPS 1B, RED 1-2-3
Interior California Larkspur	*Delphinium californicum interius*	C2	CNPS 1B, RED 3-2-3
Kern Mallow	*Eremalche kernensis*	E	CNPS 1B, RED 3-3-3
Hoover's Wooly Star	*Eriastrum hooveri*	T	CNPS 4, RED 1-2-3
Mt. Diablo Buckwheat	*Eriogonum truncatum*	C2	CNPS 1A,
Mojave Eriophyllum	*Eriophyllum mohavense*	C2	CNPS 1B, RED 2-2-3
Spiny-Sepaled Button Celery	*Eryngium spinosepalum*	C2	CNPS 1B, RED 3-2-3
Delta Button Celery	*Eryngium racemosum*	C2	E, CNPS 1B RED 2-3-3
Contra Costa Wallflower	*Erysimum capitatum angustatum*	E	E, CNPS 1B, RED 3-3-3
Diamond-Petaled California Poppy	*Eschscholzia rhombipetala*	C2	CNPS 1A, RED 3-3-3
Bogg's Lake Hedge-hyssop	*Gratiola heterosepala*	C3	E
Diablo Rock-Rose	*Helianthella castanea*	C2	CNPS 2, RED 2-2-1
California Hibiscus	*Hibiscus californicus*	C2	CNPS 2, RED 2-2-1
Santa Cruz Tarplant	*Holocarpha macradenia*	C1	E, CNPS 1B, RED 2-3-3
Hind's Walnut	*Juglans hindsii*	C2	CNPS 1B, RED 3-3-3
Contra Costa Goldfields	*Lasthenia conjugens*	C1	CNPS 1B, RED 3-3-3
Delta Tule Pea	*Lathyrus jepsonii ssp jepsonii*	C2	CNPS 1B, RED 2-2-3
Legenere	*Legenere limosa*	C2	CNPS 1B, RED 2-3-3
San Joaquin Wooly-Threads	*Lembertia congdonii*	E	CNPS 1B, RED 3-2-3

TABLE 4.6-1 (cont'd)

Common Name	Scientific Name	Status Federal	 State
Mason's Lilaeopsis	*Lilaeopsis masonii*	C2	R, CNPS 1B, RED 2-2-3
Mojave Monkey Flower	*Mimulus mohavensis*	C1	CNPS 1B, RED 2-2-3
Merced Monardella	*Monardella leucocephala*	C1	CNPS 1A
Colusa Grass	*Neostapfia colusana*	PE	E, CNPS 1B, RED 1-3-3
Antioch Dunes Evening-Primrose	*Oenothera deltoides howelii*	E	E, CNPS 1B, RED 3-3-3
Bakersfield Cactus	*Opuntia treleasei*	E	E, CNPS 1B, RED 3-3-3
Hairy Orcutt Grass	*Orcuttia pilosa*	PE	E, CNPS 1B, RED 2-3-3
San Joaquin Valley Orcutt Grass	*Orcuttia inaequalis*	PE	E, CNPS 1B, RED 2-3-3
Slender Orcutt Grass	*Orcuttia tenuis*	PE	E, CNPS 1B, RED 2-3-3
Sacramento Orcutt Grass	*Orcuttia viscida*	PE	E, CNPS 1B, RED 3-3-3
Fleshy Owl's Clover	*Orthocarpus compestris succulentus*	PT	E, CNPS 1B, RED 2-2-3
White-rayed Pentachaeta	*Pentachaeta bellidiflora*	PE	E, CNPS 1B, RED 3-3-3
Merced Phacelia	*Phacelia ciliata opaca*	C2	CNPS 1B, RED 3-1-3
Hairless Allocarya	*Plagiobothrys glaber*	C2	CNPS 1A
San Joaquin Adobe Sunburst	*Pseudobahia piersonii*	PE	E, CNPS 1B, RED 2-3-3
Valley Sagittaria	*Sagittaria sanfordii*	C2	CNPS 1B, RED 2-2-3
Showy Indian Clover	*Trifolium amoeneum*	C2	CNPS 1B, RED 3-3-3
Caper-Fruited Tropidocarpum	*Tropidocarpum capparideum*	C2	CNPS 1A
San Francisco Owl's Clover	*Triphysaria floribunda*	C2	CNPS 1B, RED 2-2-3
Greene's Tuctoria	*Tuctoria greenei*	PE	R, CNPS 1B, Vernal Pools RED 2-3-3

TABLE 4.6-1 (cont'd)

---

a/ This species has been withdrawn from proposed listing
E = Federally/state listed as endangered
T = Federally/state listed as threatened
R = Federally/state listed as rare
C1 = Category 1 Federal candidate for listing
C2 = Category 2 Federal candidate for listing
C3 = Withdrawn from candidacy for Federal listing
CSC = California species of special concern
FPT = Federal proposed threatened
FSS = Federal (BLM and U.S. Forest Service) sensitive species
PE = Proposed endangered
SPE = State proposed endangered
CNPS 1A = California Native Plant Society - Presumed extinct
CNPS 1B = California Native Plant Society - Rare, threatened, or endangered
CNPS 3 = California Native Plant Society - Need more information
CNPS 4 = California Native Plant Society - Limited distribution
RED 1-1-3 = California Native Plant Society - Rare, not endangered, endemic
RED 1-2-3 = California Native Plant Society - Rare, endangered in a portion of its range, endemic
RED 2-2-2 = California Native Plant Society - Confined range, endangered in portion of range, rare outside California
RED 2-2-3 = California Native Plant Society - Confined range, endangered in a portion of its range, endemic
RED 2-3-3 = California Native Plant Society- Confined range, endangered throughout range, endemic
RED 3-1-2 = California Native Plant Society - Highly restricted range, not endangered, rare outside California
RED 3-2-2 = California Native Plant Society - Highly restricted range, endangered in portion of range, rare outside California
RED 3-2-3 = California Native Plant Society - Highly restricted range, endangered in portion of range, endemic
RED 3-3-3 = California Native Plant Society - Highly restricted range, endangered throughout range, endemic
RED ?-2-3 = California Native Plant Society - Rarity status unclear
RED ?-?-3 = California Native Plant Society - Rare and endangered status unclear

TABLE 4.6-2

Sensitive Species and Habitats Identified and Potentially Affected Along the Proposed Route

Species	Status a/		Habitat Type b/	Survey Results c/	Comments
	Federal	State			
MOJAVE DESERT					
Animals					
Desert tortoise	T	T	Washes, Rocky hillsides, and flat sandy or gravely desert soils	Based on data collected during preconstruction surveys and construction monitoring of the existing Mojave Mainline, approximately 38 tortoises and 670 active and inactive tortoise burrows were observed along Loop 1 between MP 1 and MP 16. Approximately 100 active and inactive burrows were observed along Loop 2 between MP 0 to MP 37 but less than 10 tortoises were observed. Approximately 380 active and inactive burrows were observed along Loop 3 between MP 0 and MP 23, and 30 tortoises were observed.	
Mojave ground squirrel	C2	T	Creosote and Shadescale scrub, Joshua tree woodland	Two confirmed sightings along Loop 3: between MP 1 and MP 2 and between MP 5 and MP 6.	Potential habitat includes nearly all of Loop 3
Burrowing owl	–	CSC	Grasslands and desert communities	Four sightings along North Mainline between MP 235/241 to MP 241/247 d/ and between MP 56 and MP 57 on the Sacramento Mainline.	Potential habitat exists along the entire Northward Expansion Project
Plants					
Mojave eriophyllum	C2	CNPS 1B RED 2-2-3	Mojave Desert Scrub	In and adjacent the ROW along Loop 3 between MP 10 to MP 12.	
Foxtail cactus	C2	CNPS 1B RED 2-2-2	Mojave Desert Scrub	In and adjacent the ROW along Loop 2 between MP 35 and MP 36.	

TABLE 4.6-2 (cont'd)

Species	Status a/		Habitat Type b/	Survey Results c/	Comments
	Federal	State			
CENTRAL VALLEY					
Animals					
Swainson's hawk	C3	T	Riparian areas, agricultural fields	Numerous observations along North Mainline and Sacramento Mainline	Potential habitat occurs along the North Mainline in Merced, Stanislaus, San Joaquin and a portion of Tulare county, all of the Sacramento Mainline, Tracy, Lathrop and Ripon Segments.
Vernal pool fairy shrimp	T	--	Vernal pools located in non-native grassland	Vernal pools providing suitable habitat found along the North Mainline (Tulare and Madera Counties) Sacramento Mainline and Sacramento Segment; degraded vernal pools also found along the Fairmead Segment. Confirmed sightings between MP 44 and MP 45 and between MP 57 to MP 58 on the Sacramento Mainline and between MP 137/146 and MP 138/147 on the North Mainline.	Potential habitat includes non-natural ponding areas
Vernal pool tadpole shrimp	E	--	Vernal pools	Observed in a vernal pool between MP 81/90 and MP 82/91 on the North Mainline and between MP 58 and MP 59 on the Sacramento Mainline.	Potential habitat includes non-natural ponding areas; two populations in proposed ROW on North Mainline and Sacramento Segment
San Joaquin kit fox	E	T	Non-native grasslands in Central Valley	No active dens observed; potential dens along North Mainline, (south of Kings River) Coalinga Segment, Lindsey Segment. Confirmed sightings between MP 8 and MP 10 on the North Mainline, between MP 15 to MP 22 on Loop 4 and between MP 48 and MP 49 on the Coalinga Segment.	Dens observed may be enlarged ground squirrel burrows; kit fox may occur on any natural lands adjacent to the proposed alignments to the south of MP 89/97 on the North Mainline. Habitat is also found in the Coast Range (Alameda, Contra Costa Counties) and along the Palo Alto Segment.
Tipton kangaroo rat	E	E	Chenopod scrub	One observed at North Mainline in Tulare County between MP 47 and MP 48.	Very little habitat within historic range observed
Burrowing owl	--	CSC	Grasslands and desert communities	Four sightings along North Mainline between MP 235/241 to MP 241/247 and between MP 56 and MP 57 on the Sacramento Mainline.	Potential habitat exists along the entire Northward Expansion Project

TABLE 4.6-2 (cont'd)

Species	Status a/		Habitat Type b/	Survey Results c/	Comments
	Federal	State			
Blunt-nosed leopard lizard	E	E	Salt bush scrub	Confirmed sighting between MP 48 and MP 49 on the Coalinga Segment. Occupied habitat observed between MP 8 and MP 11 along North Mainline and between MP 48 and MP 52 on the Coalinga Segment; potential habitat also along Loop 4 between MP 15 and MP 22.	
San Joaquin antelope squirrel	C2	T	Desert wash, alkali sink, saltbush scrub	No occupied habitat observed; suitable habitat along the Coalinga Segment between MP 48 to MP 51.	
Short-nosed kangaroo rat	C2	CSC	Chenopod shrub	16 individuals observed along Coalinga Segment between MP 47 and MP 52	
Valley elderberry longhorn beetle	T	CSC	Blue elderberry bushes in riparian areas in Central Valley and desert elderberry bushes	No beetles identified, but Blue elderberry bushes observed at stream crossings including Kings River, Merced River, Tuolumne River (North Mainline); also at Calaveras River, Mosher Creek, Mokelumne River, Laguna Creek and Consumnes River (Sacramento Mainline); also observed along Coalinga Segment, Mill Creek and Stanislaus River	Bushes within ROW along Coalinga Segment may not be avoidable between MP 20 and MP 22.
Giant garter snake	PE	T	Marshes, wetlands Central Valley	Potential habitat includes stream crossings within Central Valley	Not included in field surveys
Plants					
Recurved larkspur	C2	CNPS 1B RED 1-2-3	Alkaline soils in chenopod scrub, valley saltbush scrub, and foothill grassland areas	One population observed along Coalinga Segment between MP 3 and MP 4.	Construction ROW may not completely avoid this population
Hoover's wooly star	T	CNPS 4 RED 1-2-3	Grassland component of Valley Saltbush scrub	One population observed along Coalinga Segment between MP 49 and MP 50.	Construction ROW may not completely avoid this population
Brittlescale	C2	CNPS 1B RED 3-2-2	Alkali sink scrub	One population observed along North Mainline between MP 81/90 and MP 82/91.	A portion of the observed population occurs within the proposed ROW.
Valley spearscale	C2	CNPS 1B RED 2-2-3	Alkali sink scrub	No populations were observed within the Central Valley although suitable habitat is present.	Valley spearscale was observed in the Coast Ranges

TABLE 4.6-2 (cont'd)

Species	Status a/		Habitat Type b/	Survey Results c/	Comments
	Federal	State			
Bakersfield cactus	E	E, CNPS 1B RED 333	Grassland and saltbush scrub communities in Kern River Drainage	Five populations were observed along Loop 4 between MP 11 and MP 12 and between MP 24 to MP 25.	No Bakersfield cactus populations were observed along the Northward Expansion alignments. Suitable habitat occurs between MP 8 and MP 11 along North Mainline.
Spiny-Sepaled Button Celery	C2	CNPS 1B, RED 3-2-3	Vernal Pools	A population of approximately 100 individuals was observed in a vernal pool between MP 189/198 and MP 190/199 on the North Mainline	This population may be avoided by restricting the width of the construction ROW.
COAST RANGES - SAN FRANCISCO BAY AREA					
Animals					
Burrowing owl	--	CSC	Grasslands and desert communities	Four sightings along North Mainline between MP 235/241 to MP 241/247 and between MP 56 and MP 57 on the Sacramento Mainline.	Potential habitat exists along the entire Northward Expansion Project
San Joaquin kit fox	E	T	Non-native grasslands	No occupied habitat observed in the Coast Range.	
California tiger salamander	C2	CSC	Pools or wetlands in non-native grasslands and foothill woodland communities	Larvae observed along North Mainline in Contra Costa County during field surveys (between MP 255/264 and MP 256/265)	Potential habitat exists in both Central Valley and Coast Range provinces; habitat may also include cattleponds. Additional field surveys are needed for previously inaccessible areas.
California red-legged frog	C1	CSC	Streams or ponds with dense emergent vegetation	Suitable habitat exists in Contra Costa County along the North Mainline and on the Palo Alto and Oakland Segments; occupied habitat areas observed near Kellogg Creek during 1993 field survey between MP 257/266 and MP 258/267. Occupied habitat is also known to exist between MP 18 and 19 on the Hunters Point Segment.	Potential habitat also exists in Central Valley; cattle ponds may also provide suitable habitat
Western pond turtle	C1	CSC	Permanent or nearly permanent bodies of water	Occupied habitat observed in Contra Costa County along the North Mainline between MP 209/217 and MP 210/218 and along the Antioch Segment between MP 3 and MP 4	Impacts along the Antioch Segment may not be avoidable

TABLE 4.6-2 (cont'd)

Species	Status a/		Habitat Type b/	Survey Results c/	Comments
	Federal	State			
Alameda whipsnake	C1	T	Grasslands, woodlands	Suitable habitat may exist in dense oak woodland along the North Mainline in Contra Costa County	Some areas of potential habitat in Contra Costa County were not accessible during the surveys
San Francisco garter snake	E	E	Densely vegetated ponds	Known occupied habitat exists along the Hunters Point Segment	Due to the secretive nature of this species, it was not included in the field surveys
Golden eagle	--	CSC	Grasslands, foothill oak woodlands	Golden eagles were observed in San Joaquin and Contra Costa Counties, along North Mainline between MP 233/239 and MP 265/274 and along Sacramento Mainline between MP 13 and MP 14.	
Double-crested cormorant	--	CSC	Along the coast and lake margins	A flock was observed near the San Joaquin River (San Joaquin County) along the North Mainline between MP 221/230 and MP 222/231.	No potential nesting sites observed within 0.5 miles of where the NML crosses the San Joaquin River
Suisun song sparrow	C2	CSC	Brackish marshes	Numerous sparrows were observed in Contra Costa County along the North Mainline between MP 285/294 to MP 290/299.	Potential habitat exists wherever alignments occur near coastal brackish marsh communities
Longhorn fairy shrimp	E	--	Vernal pools	Suitable habitat exists between MP 254/263 and MP 255/264 in Contra Costa County along North Mainline. Potential habitat exists between MP 248/257 and MP 249/258, however, this area was not accessible during field surveys	Non-natural ponding areas may also provide suitable habitat
Plants					
Brittlescale	C2	CNPS 1B RED 3-2-2	Alkali sink scrub	Suitable habitat was found in alkali lowlands throughout the Coast Range.	Potential habitat exists in previously inaccessible areas within the Coast Range
Heartscale	C2	CNPS-1B RED 2-2-3	Valley grasslands and alkali sink scrub	One possible population observed in Contra Costa County along North Mainline between MP 249/258 and MP 250/259.	Potential habitat along North Mainline was not accessible during field surveys
Valley spearscale	C2	CNPS 1B RED 2-2-3	Alkali sink scrub	Two populations observed between MP 249/258 and MP 250/259 along the North Mainline and near Mallard Reservoir (between MP 284/293 and MP 286/295)	Potential habitat exists within previously inaccessible portions of the Coast Range

TABLE 4.6-2 (cont'd)

Species	Status a/		Habitat Type b/	Survey Results c/	Comments
	Federal	State			
Palmate-bracted bird's beak	E	E, CNPS 1B RED 3-3-3	Alkali sink scrub	Suitable alkali wetland and habitat observed at two locations in Contra Costa County along the North Mainline; however, species was not observed	Other potential habitat along the North Mainline between MP 247/256 to MP 264/273 was previously inaccessible during field surveys
Large-flowered fiddleneck	E	E CNPS 1B RED 3-3-3	Foothill grassland and foothill woodland	No populations observed during surveys	Other potential habitat exists in previously inaccessible areas along the North Mainline between MP 247/256 to MP 276/285 and Palo Alto Segment between MP 9 and MP 28
Santa Cruz tarplant	C1	E CNPS 1B RED 2-3-3	Heavy soils or grassy flats in coastal scrub and grassland communities	No populations observed during field surveys	Other potential habitat exist along previously unaccessible areas of North Mainline
Contra Costa wallflower	E	E CNPS-1B RED 3-3-3	Sand dunes	This species occurs at the Antioch Dunes Ecological Reserve (adjacent to Antioch Segment) between MP 4 to MP 5.	
Antioch dunes evening primrose	E	E CNPS-1B RED 3-3-3	Sand dunes	Several individuals along Antioch Segment between MP 4 to MP 5.	

a/ E = Federally/state listed as endangered
T = Federally/state listed as threatened
C1 = Category 1 Federal candidate listing
C2 = Category 2 Federal candidate for listing
CSC = California species of special concern
PE = Proposed endangered
CNPS 1A = California Native Plant - Presumed extinct
CNPS 1B = California Native Plant Society - Rare, threatened or endangered
CNPS 4 = California Native Plant Society - Limited distribution
RED 1-2-3 = California Native Plant Society - Rare, endangered in a portion of its range, endemic
RED 2-2-2 = California Native Plant Society - Confined range, endangered in portion of range, rare outside California
RED 2-3-3 = California Native Plant Society - Confined range, endangered throughout range, endemic
RED 3-2-2 = California Native Plant Society - Highly restricted range, endangered in portion of range, rare outside California
RED 2-2-3 = California Native Plant Society - Confined range, endangered in a portion of its range, endemic
RED 3-3-3 = California Native Plant Society - Highly restricted range, endangered in portion of range, endemic

TABLE 4.6-2 (cont'd)

b/ The locations of threatened or endangered species habitat is shown on the maps in volume II.

c/ The specific location of species observed during the field surveys have been omitted in order to prevent unauthorized collection and habitat degradation. The Biological Survey is available for review at the FERC, SLC, BLM, FWS, and DFG locations listed in appendix G.

d/ Where two milepost numbers are given separated by a slash, the first number is the milepost in the pipeline configuration to serve Alternative Customer Group 1 in addition to the Core Customer Group, and the second number is the milepost in the pipeline configuration to serve Alternative Customer Group 2 in addition to the Core Customer Group. Where only one milepost is given, the pipeline configuration would be the same in that area to serve both alternative customer groups. Where no number is given before or after the slash, the entry only applies to one configuration or the other.

4.7 LAND USE, TRANSPORTATION, RECREATION, AND VISUAL RESOURCES

4.7.1 Land Use

This section addresses the ownership, use, and management of private and public lands that could be affected by the proposed project including recreational resources and aesthetics. The tables and maps referred to in this section indicate the types of land use resources that could be affected by the proposed pipeline segments and aboveground facilities. Where the proposed pipeline route is within railroad, surface road, or utility rights-of-way, the adjacent land use was considered in order to more accurately depict the existing conditions. The text in this section summarizes these resource types and only discusses specific pipeline segments when unique or nonrepresentative resources would be affected. The five types of land uses are:

- Agricultural — Includes vineyards, orchards, nurseries, tree farms, pasture, and animal husbandry operations as well as irrigated and dry cropland.
- Range and open land — Range is defined here as land used primarily for livestock grazing and includes both woodland range where large woody vegetation exists and open range where scrub or grassland dominates the landscape. Undeveloped land is included in this land use type.
- Residential — Includes farmhouses as well as single and multiple family dwellings in urban and suburban areas.
- Industrial/commercial — Includes all business establishments, associated land areas controlled by industrial or commercial facilities, and road, railroad, and utility rights-of-way.
- Other — Includes open water, scenic rivers, wetlands, nonrange woodlands, parks, schools, military installations, and other institutionally controlled facilities.

The proposed pipeline would consist of either 660 or 681 miles of mainline, loops, and segments depending on the final customer group selection. The predominant land uses adjacent to the proposed route are range/open land (42 to 44 percent) and agricultural (35 percent of the total route in either case). The remainder of the route crosses industrial/commercial (16 to 18 percent), residential (1 to 2 percent), and other land uses (3 to 4 percent).

4.7.1.1 Pipeline Rights-of-Way

Fifteen counties would be crossed by the proposed pipeline: Alameda, Contra Costa, Fresno, Kern, Kings, Madera, Merced, Sacramento, San Bernardino, San Francisco, San Joaquin, San Mateo, Santa Clara, Stanislaus, and Tulare. Once the project is operational, Mojave would maintain permanent right-of-way that would be 30 feet wide or less. The right-of-way acreage requirements would vary depending on the pipe diameter, engineering requirements, environmental constraints, and space limitations. Table 4.7.1.1-1 shows the temporary and permanent rights-of-way and land areas that would be required for the various pipeline segments and compressor stations.

TABLE 4.7.1.1-1

Construction and Operation Areas Required for the Proposed Project

Pipeline Segment	Pipeline Diameter (inches)	Pipeline Length (miles)	Temporary Construction ROW (feet)	Permanent Operational ROW (feet)	Temporary Construction Area (acres)	Permanent Operational Area (acres)
Core Project						
North Mainline	10-30	238.5	25-75	0-30	1,947	388
Sacramento Mainline	12-16	63.4	65	0-10	499	33
Coalinga Segment	10	52.5	65	10	414	64
Sanger Segment	6	11.2	30	0-10	41	1
Livingston Segment	4	0.2	30	0	1	0
Ceres Segment	4	2.2	30	0-10	8	1
Modesto B Segment	6	4.7	30	0-10	17	1
Tracy Segment	12	1.9 a/	65	0-10	15	1
Palo Alto Segment	12 b/	49.0	25-65	0-10	357	50
Antioch Segment	10	4.4	30	0-10	16	3
Fremont Segment	4	15.6	30	0-10	56	10
Loop 1 (Mojave Mainline)	30	15.5	75-95	0	141	0
Loop 2 (Mojave Mainline)	30	36.7	75-95	0	348	0
Loop 3 (Commonline)	30	22.9 c/	75	0	208	0
Loop 4 (East Side Lateral)	30	25.0 c/	75	0-10	227	9
Lindsay Segment	6	17.1	30	0-10	62	3
Additional Facilities to Serve Alternative Customer Group 1						
Famoso Alternative Segment	30	51.5	75	0-30	468	55
Kingsburg Segment	4	0.4	30	0	1	0
Turlock A Segment	4	3.2	30	0	12	0
Lathrop Segment	6	8.2	30	0	30	0
Tracy Segment	6	3.9	30	0-10	14	2
Oakland Segment	8	31.7	30	0-10	115	18
Additional Facilities to Serve Alternative Customer Group 2						
Lindsay Alternative Segment	30	42.6	75	0-20	387	14
McFarland Segment	8	9.4	30	0-10	34	1
Malaga Segment	6	0.7	30	0-10	3	1
Madera Segment	4	6.2	30	0-10	23	7
Fairmead Segment	4	5.0	30	0-10	18	6
Turlock Segment	4	3.4	30	0-10	12	4
Ripon Segment	6	2.0	30	0-10	7	2
Sacramento Segment (A-159)	12	7.5	65	0-10	59	9
Tracy Segment (A-160)	12	2.7	65	0-10	21	3
Tracy Segment (A-161)	4	1.9	30	0-10	7	2

TABLE 4.7.1.1-1 (cont'd)

Pipeline Segment	Pipeline Diameter (inches)	Pipeline Length (miles)	Temporary Construction ROW (feet)	Permanent Operational ROW (feet)	Temporary Construction Area (acres)	Permanent Operational Area (acres)
Antioch Segment (A-174)	10	4.9	30	0-10	18	5
Martinez Segment (A-172)	10	1.0	65	0-10	8	1
Hunters Point Segment	12	30.1	65	0-10	236	23
San Francisco Segment	6	1.5	30	0	5	0
Compressor Stations						
Topock	--	--	--	--	0	0
Amboy	--	--	--	--	21	21
Daggett	--	--	--	--	18	18
Famoso d/	--	--	--	--	20	20
Lindsay d/	--	--	--	--	17	17

---

a/ Tracy Segment extended 0.3 mile to 2.2 miles for Alternative Customer Group 2.

b/ 17.7 miles of the Palo Alto Segment would be increased to 20 inches in diameter for Alternative Customer Group 2.

c/ Only if Kern River expands coincidentally with Mojave; if only Mojave expands, Loop 3 would not be built, and Loop 4 would only be 4.0 miles long.

d/ Depending on the alternative customer group served, only one of these two compressor stations would be built.

Approximately 80 percent of the permanent right-of-way would be in or adjacent to existing railroad, surface road, or utility rights-of-way. Approximately 88 percent of the 100.1 miles of pipeline loops would be in Mojave's existing right-of-way. Approximately 79 percent of the 514.9 miles of right-of-way through the Central Valley and 91 percent of the 140.5 miles through the Coast Ranges-San Francisco Bay Area would be in or adjacent to existing right-of-way, primarily SP railroad right-of-way. Mojave would temporarily use of some property outside the existing railroad and surface road rights-of-way where the land use is open agricultural land.

Table 4.7.1.1-2 summarizes the land ownership along the proposed pipeline route. About 93 percent of the route crosses city, county, or privately owned land, and 7 percent crosses public land administered by Federal or state agencies including the BLM (29.4 miles), U.S. Bureau of Reclamation (BOR) (1.9 miles), U.S. Department of Defense (6 miles), U.S. Department of Energy (1 mile), and U.S. Department of Agriculture (0.8 mile). Much of the BLM-administered land is used for recreational purposes such as hunting, camping, and hiking. In BLM's California Desert Conservation Area (CDCA), 2-mile-wide utility corridors have been designated for the construction and/or modification of pipelines or canals for the bulk transportation of natural gas, petroleum, electricity, and water. Defense facilities that would be crossed by the proposed pipeline include the Concord Naval Weapons Center and the Naval Air Station at Lemoore. These and other Federal and state facilities crossed by the route are shown on the maps in volume II.

Many of Mojave's customers are in commercial and industrial areas; consequently, the proposed route crosses some highly developed urban and suburban areas. The construction right-of-way would be within 50 feet of residences in many areas. These areas are identified in table 4.7.1.1-3 at the end of section 4.7. Construction in residential areas would be primarily contained within street or railroad rights-of-way. No temporary or permanent right-of-way would cross the yard of any residence. The designated land use and ownership of land crossed by the proposed route are shown on the maps in volume II of this EIR/EIS.

The CCWD has received approval and has begun to build the 1,500-acre Los Vaqueros Reservoir and about 20 miles of pipeline to move water to and from storage. The project also includes the realignment of Vasco Road and the relocation of several existing utilities to a designated utility corridor. The CCWD will purchase 18,600 acres of undeveloped land around the area to be flooded as habitat for the San Joaquin kit fox, birds, and other wildlife. The proposed pipeline route crosses the Los Vaqueros watershed within the designated utility corridor identified in the EIR/EIS for that project as discussed in section 3.3.3 (CCWD, 1993).

4.7.1.2 Aboveground Facilities

In the Mojave Desert, the Amboy and Daggett Compressor Stations would be within the 2-mile-wide BLM-administered CDCA utility corridors and would each require 20 acres of land or less. Open land, mostly undisturbed desert scrub, surrounds the proposed sites. Modification of the existing Topock Compressor Station in Arizona would not require any additional land.

In the Central Valley, a third compressor station would be built on privately owned land on the North Mainline at MP 19.6 in Famoso to serve Alternative Customer Group 1 or at MP 59.0 in Lindsay (MP 42.6 on the Lindsay Alternative) to serve Alternative Customer Group 2. In Famoso, 20 acres, primarily agricultural and range land, would be required. In Lindsay, 17.23 acres, currently citrus groves, would be required. According to the City of Lindsay General Plan, the land is designated for mixed use including commercial and light industrial.

TABLE 4.7.1.1-2

Summary of Land Ownership Along the Proposed Route

	Miles Traversed a/						
Pipeline Segment	BLM	BOR	DOD	Other Fed	State	County, City, or Private	Total
Core Project							
North Mainline		1.9 (0.8%)	3.5 (1.4%)		0.6 (0.25%)	232.5 (97.5%)	238.5
Sacramento Mainline						63.4 (100%)	63.4
Coalinga Segment			2.5 (5%)			50.0 (95%)	52.5
Sanger Segment						11.2 (100%)	11.2
Livingston Segment						0.2 (100%)	0.2
Ceres Segment						2.2 (100%)	2.2
Modesto B Segment						4.7 (100%)	4.7
Tracy Segment						1.9 (100%)	1.9
Palo Alto Segment				DOE: 1.0 (2%)	0.4 (1%)	47.6 (97%)	49.0
Antioch Segment					0.2 (5%)	4.2 (95%)	4.4
Fremont Segment						15.6 (100%)	15.6
Loops 1 and 2	18.2 (35%)					34.0 (65%)	52.2
Loop 3	11.2 (49%)					11.7 (51%)	22.9
Loop 4				USDA: 0.8 (3%)		24.2 (97%)	25.0
Lindsay Segment						17.1 (100%)	17.1
SUBTOTAL	29.4 (5.5%)	1.9 (0.4%)	6.0 (1.1%)	1.8 (0.3%)	1.2 (0.2%)	520.5 (92.6%)	560.8
Additional Facilities to Serve Alternative Customer Group 1							
Famoso Alternative						51.5 (100%)	51.5
Kingsburg Segment						0.4 (100%)	0.4
Turlock A Segment						3.2 (100%)	3.2
Lathrop Segment						8.2 (100%)	8.2
Tracy Segment						3.9 (100%)	3.9
Oakland Segment						31.7 (100%)	31.7
SUBTOTAL	0	0	0	0	0	98.9 (100%)	98.9

TABLE 4.7.1.1-2 (cont'd)

Pipeline Segment	Miles Traversed a/ BLM	BOR	DOD	Other Fed	State	County, City, or Private	Total
Additional Facilities to Serve Alternative Customer Group 2							
Lindsay Alternative						42.6 (100%)	42.6
McFarland Segment						9.4 (100%)	9.4
Malaga Segment						0.7 (100%)	0.7
Madera Segment						6.2 (100%)	6.2
Fairmead Segment						5.0 (100%)	5.0
Turlock Segment						3.4 (100%)	3.4
Ripon Segment						2.0 (100%)	2.0
Sacramento Segment (A-159)						7.5 (100%)	7.5
Tracy Segment (A-160)						3.6 (100%)	3.6
Tracy Segment (A-161)						1.9 (100%)	1.9
Antioch Segment (A-174)						4.9 (100%)	4.9
Martinez Segment (A-172)						1.0 (100%)	1.0
Hunters Point Segment						30.1 (100%)	30.1
San Francisco Segment						1.5 (100%)	1.5
SUBTOTAL	0	0	0	0	0	119.8 (100%)	119.8

a/ Totals in Federal and state columns do not include Federal and state highways traversed by the proposed pipeline route.

BLM = U.S. Bureau of Land Management.
BOR = U.S. Bureau of Reclamation.
DOD = U.S. Department of Defense.
DOE = U.S. Department of Energy.
USDA = U.S. Department of Agriculture.

New meter stations would be constructed at various points along the pipeline route. The typical meter station would be 100 by 100 feet, enclosed by a 6-foot-high cyclone fence within the permanent right-of-way. As shown in table 4.7.1.2-1, most of the new meter stations in the Central Valley would be in agricultural areas, and most in the San Francisco Bay Area would be in industrial/commercial areas.

During construction, Mojave would use 11 temporary stockpile areas of 2 to 33 acres each for equipment and materials storage (see table 2.3.1-1). One would be in the Mojave Desert area, seven in the Central Valley, and three in the Bay Area. All proposed stockpile areas are previously disturbed and commercially available private open land, primarily railroad yards.

4.7.2 Transportation

The proposed route crosses many linear transportation and utility rights-of-way including major highways, roads, railroad tracks, canals, aqueducts, pipelines, and power and telephone lines. Major highways would be crossed at the 54 locations listed in table 4.7.2-1; major highways are defined as interstate, U.S. highway, and state routes. Many county and local roads would also be crossed. Major or improved roads and railroads would be crossed by boring to avoid disrupting traffic. Additional temporary work areas, typically 30 by 75 feet, would be required on each side of the crossing to accommodate boring equipment, soil storage, and pipeline fabrication. Unsurfaced, lightly traveled, or rural roads would be crossed by the open-cut method if approved by the owner or road management agency, and an additional temporary staging area 30 by 50 feet would be required on each side of the crossing. Pipeline installation at open-cut crossings including cleanup and restoration of road surfaces would be typically completed in one day.

Mojave would make provisions to detour or control traffic during such construction. The proposed route is within or adjacent to several roadways and would jointly use the existing rights-of-way. As much of the route also parallels railroad tracks, the pipeline would alternate from one side of the tracks to the other within the railroad right-of-way to avoid existing utilities and other engineering problems. Pipe and other project materials would be transported to the stockpile areas by railroad. Construction vehicles would load equipment and materials at the stockpile areas and transport them to the construction right-of-way using surface streets.

Approximately 205 miles of pipeline would be constructed within roadways (public rights-of-way), and 38 miles would be constructed adjacent to roadways. Construction within roadways would involve removing the pavement, trenching, stringing and welding pipe, backfilling and compacting soil, and repaving. Mojave would implement traffic control measures including detours to minimize traffic delays. Traffic volumes along surface streets are expected to be highest for segments in the San Francisco Bay Area (Palo Alto, Fremont, Antioch, and Hunters Point). Most cities would require Mojave to obtain encroachment permits for work in or crossing public rights-of-way.

4.7.3 Recreation and Public Interest Areas

The proposed route does not cross any remnant prairies, registered national natural landmarks, or land designated for study or listed under the National Wilderness Act (Title 16, United States Code [USC] Section 1132). The route does not cross any waterway listed under the National Wild and Scenic River Act (16 USC 1271) or any state wild and scenic river. The proposed route does not cross any wilderness areas designated under the California Desert Protection Act or areas not released from the

TABLE 4.7.1.2-1

Land Uses at the Proposed Meter Station Sites

Pipeline Segment	Meter Station	Milepost a/	Land Use
North Mainline	Bakersfield A	7.5	Rangeland
	Bakersfield B	16.3	Agricultural
	McFarland	25.6/9.4 (Famoso Alt.)	Agricultural
	Delano b/	31.4	Industrial/Agricultural
	Pixley b/	50.8	Agricultural
	Tulare b/	64.9	Agricultural
	Tulare C c/	85.6	Agricultural
	Selma	94.7/103.5	Agricultural
	Fresno	108.8/117.4	Agricultural/Industrial
	Madera b/	129.9	Agricultural/Commercial
	Chowchilla b/	147.0	Agricultural
	Turlock C b/	190.6	Agricultural
	Modesto F	203.8/212.6	Residential/Commercial
	Modesto G	205.8/214.5	Industrial
	Martinez A	287.3/296.2	Industrial
	Martinez B	288.0/296.9	Industrial
	Martinez C	291.0/299.4	Industrial
Lindsay Segment	Lindsay	17.1	Commercial/ Industrial
Kingsburg Segment	Kingsburg b/	0.4	Agricultural
Coalinga Segment	Hanford A	11.9	Residential/Commercial
	Hanford B	13.3	Agricultural
	Lemoore A	20.9	Agricultural
	Lemoore B	21.0	Agricultural
	Coalinga	52.5	Agricultural
Sanger Segment	Malaga b/	0.6	Agricultural
	Sanger A	11.2	Agricultural
	Sanger B	11.0	Agricultural/Commercial
Malaga Segment	Malaga A c/	0.4	Agricultural
	Malaga B c/	0.7	Agricultural
Madera Segment	Madera A c/	4.9	Agricultural/Industrial
	Madera B c/	6.0	Industrial
	Madera C c/	6.2	Industrial
	Madera D c/	1.8	Agricultural/Industrial
Livingston Segment	Livingston	0.2	Residential
Fairmead Segment	Fairmead	5.0	Open land
	Turlock A b/	3.2	Agricultural
	Turlock c/	3.4	Agricultural
Ceres Segment	Ceres A	1.3	Agricultural/Industrial
	Ceres B	2.2	Agricultural/ Industrial
Modesto B Segment	Modesto B	1.4	Industrial
	Modesto C	2.3	Industrial
	Modesto D	4.0	Industrial/Agricultural
	Modesto E	4.7	Industrial/Agricultural
Ripon Segment	Ripon c/	2.0	Industrial

TABLE 4.7.1.2-1 (cont'd)

Pipeline Segment	Meter Station	Milepost a/	Land Use
Tracy Segment	Tracy C	4.5	Industrial
	Tracy D	5.8	Industrial
	Tracy A b/	1.0	Industrial
	Tracy B b/	1.9	Agricultural
Tracy (A-160) Segment	Tracy A c/	0.9	Industrial
Tracy (A-161) Segment	Tracy B c/	1.9	Industrial
Palo Alto Segment	Santa Clara A	29.7	Agricultural
	Santa Clara B	33.3	Industrial
	Santa Clara C c/	33.7	Industrial
	Palo Alto A	46.0	Residential
	Palo Alto B	49.0	Commercial
	Palo Alto C c/	44.6	Residential
	Palo Alto D c/	46.9	Residential
Oakland Segment	San Leandro b/	26.0	Industrial
	Oakland b/	31.7	Industrial
Fremont Segment	Fremont A	11.4	Industrial
	Fremont B	15.6	Industrial
	Fremont C	3.0	Industrial
Antioch Segment	Antioch A	4.4	Industrial
	Antioch B b/	2.8	Industrial
	Antioch C c/	2.5	Industrial
	Antioch C b/	2.1	Industrial
Antioch (A-174) Segment	Antioch B c/	4.9	Industrial
Hunters Point Segment	Hunters Point c/	30.1	Industrial
San Francisco Segment	San Francisco c/	1.5	Industrial
Sacramento Mainline	Ripon b/	0.1	Agricultural
	Stockton	13.4	Agricultural
	Lodi	31.3	Agricultural
	Sacramento B	63.4	Agricultural
Sacramento (A-159) Alternative	Sacramento A c/	7.5	Industrial
Lathrop Alternative Segment	Lathrop b/	8.2	Industrial

---

a/ Where two milepost numbers are given separated by a slash, the first number is the milepost in the pipeline configuration to serve Alternative Customer Group 1 in addition to the Core Customer Group, and the second number is the milepost in the pipeline configuration to serve Alternative Customer Group 2 in addition to the Core Customer Group. Where only one milepost number is given, the pipeline configuration would be the same in that area to serve both alternative customer groups. Where no number is given before or after the slash, the entry only applies to one configuration or the other.

b/ Alternative Customer Group 1 only.

c/ Alternative Customer Group 2 only.

TABLE 4.7.2-1

Major Highways Crossed by the Proposed Route

Pipeline Segment	Milepost a/	Highway
Core Project		
North Mainline	16.3	State Route 65 (Porterville Hwy)
	74.1/82.6	State Route 99
	74.5/83.0	State Route 198 (Sierra Blvd.)
	145.2/153.7	State Route 99
	166.0/174.6	State Route 59 ("J" St.)
	183.1/191.7	State Route 99
	202.5/211.3	State Route 99
	211.0/219.7	State Route 219 (Kiernan Ave.)
	227.2/235.9	Interstate 5
	228.0/236.7	State Route 33 (Ahern Rd.)
	236.1/244.8	Interstate 580
	248.8/257.6	Interstate 580
	277.5/286.5	State Route 4 (John Muir Pkwy.)
Sacramento Mainline	2.3	State Route 99
	5.4	State Route 120 (Yosemite Ave.)
	15.4	State Route 4 (Farmington Rd.)
	19.5	State Route 26 (Fremont St.)
	30.2	State Route 88/12
	59.3	State Route 99
Lindsay Segment	0.00	State Route 99 (Alternate)
	0.60	State Route 99
	16.90	State Route 65 (Porterville Hwy)
Coalinga Segment	45.6	Interstate 5
Palo Alto Segment	14.4	Interstate 680
	23.8	Interstate 680
	26.0	Interstate 880/State Route 17 (Nimitz Fwy.)
	28.0	State Route 237 (Mt. View - Alviso Rd.)
	32.8	U.S. Highway 101 (Bayshore Fwy.)
	40.8	State Route 237 (Mt. View - Alviso Rd.)
	41.5	State Route 85 (Stevens Creek Fwy.)
	47.2	State Route 82 (El Camino Real)
Antioch Segment	2.1	State Route 4 (John Muir Pkwy.)
Fremont Segment	5.5	Interstate 880
	11.6	Interstate 880
Loop 1 (Mojave Mainline)	60.20	U.S. Highway 66 (Cross National Trails Hwy.)
Loop 2 (Mojave Mainline)	86.20	U.S. Highway 66 (Cross National Trails Hwy.)
Loop 3 (Commonline)	42.00	U.S. Highway 395
Loop 4 (East Side Lateral)	3.40	State Route 223 (Bear Mtn. Blvd.)
	10.90	State Route 58
	19.80	State Route 178

TABLE 4.7.2-1 (cont'd)

Pipeline Segment	Milepost a/	Highway
Additional Facilities to Serve Alternative Customer Group 1		
Famoso Alternative	34.3	State Route 155 (Garces Hwy.)
Turlock A Segment	1.10	State Route 99
Lathrop Segment	3.30	State Route 99
Oakland Segment	9.0	Interstate 580
	10.7	Interstate 680
	11.8	Interstate 580
	17.3	Interstate 580
	22.5	State Route 238 (Oakland-Tracy Fwy.)
	31.5	State Route 17
Additional Facilities to Serve Alternative Customer Group 2		
North Mainline	--/27.7	State Route 155 (Garces Hwy.)
	--/47.6	State Route 190 (Ave. 144)
	--/58.8	State Route 65 (Kaweah Ave.)
Madera Segment	0.04	State Route 99
San Francisco Segment	0.51	U.S. Highway 101 (Bayshore Fwy.)

---

a/ Where two milepost numbers are given separated by a slash, the first number is the milepost in the pipeline configuration to serve Alternative Customer Group 1 in addition to the Core Customer Group, and the second number is the milepost in the pipeline configuration to serve Alternative Customer Group 2 in addition to the Core Customer Group. Where only one milepost number is given, the pipeline configuration would be the same in that area to serve both alternative customer groups. Where no number is given before or after the slash, the entry only applies to one configuration or the other.

requirements of Section 603(c) of the Federal Land Policy and Management Act of 1976 pertaining to the management of wilderness study areas.

The proposed route crosses and parallels U.S. Route 66 (Cross National Trails Highway), a popular sightseeing route providing access to California desert recreation and public interest areas. The proposed route is adjacent to and crosses the proposed Juan Bautista de Anza National Historic Trail in several areas including the North Mainline from MP 278.0 to MP 285.2 (if Alternative Customer Group 1 is served) or from MP 286.9 to MP 294.1 (if Group 2) and the Palo Alto Segment from MP 23.5 to MP 28.0 and MP 41.0 to MP 47.6. In addition, the Hunters Point Segment would be within 0.1 mile east of the trail from MP 1.0 to MP 2.0 and from MP 5.8 to MP 11.0. The pipeline would be constructed within the 1-mile-wide historic trail corridor along the Oakland Segment (MP 23.0 to MP 25.3), the Antioch Segment (MP 3.0 to MP 4.5), and the Hunters Point Segment (MP 11.0 to MP 20.0). This continuous recreation trail, which extends from Arizona to San Francisco, is about 50 percent covered by roads including El Camino Real from Palo Alto to San Francisco. The trail is managed locally in each jurisdiction crossed.

The North Mainline would cross the Black Diamond Mines Regional Preserve, for 1.0 mile beginning at MP 268.8/277.5, following recreational trails for 0.9 mile. In addition to the existing recreation and public interest areas listed in table 4.7.3-1 at the end of section 4.7, the proposed pipeline route crosses several areas proposed for designation:

- A parkway and multiuse recreation trail system in Fresno County that would extend along both sides of the San Joaquin River from the east side of Highway 99 to the Friant Dam. At MP 121.4, the pipeline would be installed by drilling under the San Joaquin River on the east side of Highway 99.
- In Alameda and Contra Costa counties, the Los Vaqueros Reservoir watershed would be crossed at MP 252.7/261.3. The proposed pipeline would also cross approximately 7.8 miles of planned recreation lands surrounding the soon to be constructed Los Vaqueros Reservoir, including the Vasco Caves and Brushy Peak Park. The future recreational areas will be administered by the EBRPD, LARPD, and CCWD.
- In the city of Mountain View, 0.1 mile of Stevens Creek Park Chain, a proposed creekside park system, would be crossed along the railroad right-of-way at MP 41.5 on the Palo Alto Segment.

Table 4.7.3-1 at the end of section 4.7 lists the recreation and public interest areas that are crossed by or near the proposed route.

4.7.4 Visual Resources

Mojave completed a visual resources survey for the proposed project in order to identify potentially significant effects on existing views and landscape scenes using a system adapted from the BLM Visual Resource Management (VRM) system (WCC, 1994). Three primary components were evaluated; scenic quality, classified according to landscape character type; visual sensitivity, which takes sensitive land uses and cultural features into account; and visibility, based on the potential visibility of the proposed route and above ground facilities. These components were evaluated by field reconnaissance, reviewing USGS 7.5-minute topographic maps, aerial photographs and videotapes of the proposed route, and county land use and other maps.

In the Mojave Desert, the proposed route loops the existing pipeline. The visual impacts of construction and operation of the existing pipeline were identified and evaluated in the Mojave-Kern River-El Dorado Natural Gas Pipeline Projects, incorporated by reference herein (SLC and FERC, 1987). The Mojave Desert has multiple landforms including valleys, bajadas, alluvial fans, mountain ranges, washes, and dry lake beds. The primary land uses are range land, open space, and crop land. The BLM uses its VRM system to classify scenic resources, identify visual quality objectives, and develop management policies for the administration of these resources on BLM land. The BLM has categorized the scenic resources within the Mojave Desert. The predominant visual resource management classes near the pipeline are VRM Class II and III and the predominant scenic quality was identified as good or fair. Specific scenic resources identified along the loop segments include the Cadiz Summit/Marble Mountains (Loop 1 MP 9 to MP 12), Bristol Mountains (Loop 1 MP 13 to 15.5, Amboy Compressor Station, and Loop 2 MP 0 to MP 6.5), and Lava Hills Wilderness Study Area (Loop 2 MP 6.5 to MP 11.1). The critical viewpoint for these scenic resources is Interstate Highway 40. Existing modifications within the critical viewpoint include underground natural gas pipelines and pipeline access roads which the proposed route would follow.

The Central Valley's topography is generally flat with occasional rolling foothills. The primary land use is agriculture including vineyards, orchards, and annual crops. The North Mainline would cross several rivers that are visible from State Route 99. The Lindsay Alternative would cross the Tule River, and the Madera Segment would cross Cottonwood Creek, both of which are visible to motorists.

Topography of rolling valleys and foothills dominate the landscape of eastern Alameda and central Contra Costa Counties, becoming generally flat near the San Francisco Bay. Land uses in the foothills and valleys include parks and recreation areas, range land, and agricultural uses such as vineyards, orchards, pasture, and row and field crops. Urban development dominates the flat lands surrounding San Francisco Bay. Fog is a regular climatic phenomenon in the San Francisco Bay Area, sometimes restricting viewing distances. In the flat urban setting, landscaped plantings and small parks provide visual relief within short-distance visibility zones. Long-distance visibility zones from the urban areas include mountain ranges south and west of the Bay.

Three sensitive landscapes are crossed by the proposed route. The proposed route of the North Mainline would cross the Black Diamond Regional Preserve in northern Contra Costa County in an area visible from hiking trails. The Palo Alto Segment would cross steep rugged terrain in Mission Peak Regional Preserve and Sunol Regional Wilderness in areas visible from hiking trails. Table 4.7.4-1 lists the sensitive scenic resources along the proposed route.

TABLE 4.7.4-1

Sensitive Scenic Resources Along the Proposed Route

Segment and Milepost a/	Resource b/	Critical Viewpoint	Duration of View (seconds)	No. of Viewers per Day c/
Core Project				
North Mainline				
88.3 - 88.7/96.9 - 97.3	Kings River crossing	State Route 99; pipeline would parallel road	5	30,000
121.5 - 121.8/130.0 - 130.3	San Joaquin River crossing	State Route 99; pipeline would parallel road	20	42,498
129.2 - 130/137.7 - 138.5	Cottonwood Creek crossing	State Route 99; pipeline would parallel road	7	39,165
151.2 - 151.3/159.8 - 159.9	Chowchilla River crossing	State Route 99; pipeline would parallel road	7	27,082
182.1 - 182.4/190.8 - 191.1	Merced River crossing	State Route 99; pipeline would parallel road	20	32,082
203.3 - 203.4/212.0 - 212.1	Tuolumne River crossing	State Route 99; pipeline would parallel road	65	63,725
258.6 - 258.7/267.3 - 267.4	Valley bottom, grassy hills	Vasco Road (county scenic highway); pipeline would cross road	41	11,250
264.3 - 265.3/273.0 - 274.0	Narrow valley, steep grassy hills	Deer Valley Road (county scenic highway); pipeline would cross road	154	5,031
268.9 - 269.4/277.6 - 278.1	Regional preserve, creek bottom, steep wooded hillsides	Trail in Black Diamond Mines Regional Preserve	1,800	14
269.4 - 270.0/278.1 - 278.7	Open grassy rolling hills bordering parkland	Trail in Black Diamond Mines Regional Preserve	1,320	14
270.0 - 271.1/278.7 - 279.8	Regional park, grassy hills	Contra Loma Regional Park; reservoir and beach area.	240	284
272.0 - 272.1/280.7 - 280.8	Open, steep hill	Somersville Road (county scenic highway in valley setting); pipeline would cross road	10	10,901
274.6 - 274.7/283.4 - 283.5	Narrow creek bottom, grassy side hills	Kirker Pass Road (county scenic highway in valley setting); pipeline would cross road	10	17,833
Palo Alto Segment				
6.3 - 6.8	Sycamore woodland	Trails in Sycamore Grove Park	600	274
12.8 - 14.5	Sunol Valley, viewshed of scenic highway	Interstate 680 (state designated scenic highway); pipeline would parallel highway	105	78,968
18.6 - 20.0	Steep, rugged terrain, variety of vegetation and landforms	Several trails would be crossed and paralleled in Mission Peak Regional Preserve adjacent to Sunol Regional Wilderness	1,680	21
Additional Facilities to Serve Alternative Customer Group 1				
Oakland Segment				
0.0 - 0.6	Sycamore woodland	Trails in Sycamore Grove Park	10,800	274
12.0 - 18.5	Rolling to steep terrain, dense vegetation	I-580 (eligible for state scenic highway designation); pipeline would parallel I-580	233	11,246

TABLE 4.7.4-1 (cont'd)

Segment and Milepost a/	Resource b/	Critical Viewpoint	Duration of View (seconds)	No. of Viewers per Day c/
Additional Facilities to Serve Alternative Customer Group 2				
Lindsay Alternative				
--/48.2 - 48.4	Tule River crossing	Westwood Drive; pipeline would parallel road	60	4,250
Madera Segment				
0.3 - 0.4	Cottonwood Creek crossing	State Route 99; pipeline would parallel road	7	39,165

---

a/ Where two milepost numbers are given separated by a slash, the first number is the milepost in the pipeline configuration to serve Alternative Customer Group 1 in addition to the Core Customer Group, and the second number is the milepost in the pipeline configuration to serve Alternative Customer Group 2 in addition to the Core Customer Group. Where only one milepost number is given, the pipeline configuration would be the same in that area to serve both alternative customer groups. Where no number is given before or after the slash, the entry only applies to one configuration or the other.

b/ Major creeks and rivers with permanent water and a corridor of natural riparian vegetation are rated high in scenic quality. Some water features such as the Fresno River had disturbed river banks with poor vegetation cover and did not rate as high.

c/ Based on a 10-hour day.

TABLE 4.7.1.1-3

Residences Within 50 Feet of the Construction Right-of-Way

Pipeline Segment	Approximate Mileposts	Number of Residences a/	Pipeline within Street Easement	Pipeline within Railroad Easement
Core Project				
North Mainline (Famoso Alternative)	17.5	1	Yes	No
	28.4 - 28.8	≥ 20	No	Yes
	39.4	1	No	Yes
	41.4	1	No	Yes
	42.4	1	No	Yes
	44.2	1	No	Yes
	44.2	1	No	Yes
	50.5	5	No	Yes
	61.1 - 61.8	3	No	Yes
	63.1 - 63.3	1	No	Yes
North Mainline	95.6/104.3 - 95.9/104.6	0 - 8	No	Yes
	103.7/112.8	1	No	Yes
	120.4/129 - 121.1/129.7	18 - 35	No	Yes
	131.1/139.7	1	No	Yes
	133.6/142.2 - 133.8/142.4	5 - 10	No	Yes
	142.4/150.9	1	No	Yes
	143.6/152.1 - 143.9/152.4	2	No	Yes
	153.4/162	1	No	Yes
	160.1/168.6	1	No	Yes
	169.6/178.2	1	No	Yes
	170.2/178.8 - 170.6/179.2	0 - 10	No	Yes
	171.8/180.3 - 172.1/180.6	8 - 15	No	Yes
	172.4/181.0 - 172.5/181.1	0 - 3	No	Yes
	172.7/181.3	1	No	Yes
	174.2/182.8 - 174.4/183.0	3	Yes	No
	176.4/185.0 - 176.6/185.2	2	No	Yes
	177.9/186.4	1	No	Yes
	179.9/188.6	1	No	Yes
	180.9/189.6 - 181.0/189.7	0 - 3	Yes	No
	182.8/191.5	1	Yes	No
	190.3/198.9 - 190.5/199.1	5 - 10	No	Yes
	194.2/202.9	1	No	Yes
	197.8/206.5	1	Yes	No
	199.0/207.7 - 199.6/208.3	13 - ≥ 25	No	Yes
	200.3/209.1	1	No	Yes
	200.4/209.2	1	No	Yes
	201.7/210.4 - 201.9/210.6	0 - 5	No	Yes
	202.8/211.6 - 203/211.8	6 - 10	No	Yes
	210.6/219.3 - 211.7/220.4	0 - 55	No	Yes
	212.0/220.7 - 213.6/222.3	7	Yes	No
	214.1/222.8	1	Yes	No
	221.4/229.9	1	Yes	No
	226.1/234.8	1	Yes	No
	226.7/235.4 - 227.9/236.6	8	Yes	No
	229.8/238.4	1	Yes	No

TABLE 4.7.1.1-3 (cont'd)

Pipeline Segment	Approximate Mileposts	Number of Residences a/	Pipeline within Street Easement	Pipeline within Railroad Easement
North Mainline (cont'd)	230.2/238.8 - 230.4/239.0	0 - 5	Yes	No
	230.4/239.0 - 230.8/239.4	2	Yes	No
	230.8/239.4 - 231.4/240.0	0 - 15	No	Yes
	232.0/240.6 - 232.2/240.8	1	No	Yes
	250.1/258.9 - 250.2/259.0	2	No	No
	270.2/279.4 - 271.2/280.4	85	No	No
	273.7/282.5	1	No	No
	277.0/285.8 - 277.1/285.9	0 - 5	No	No
	277.5/286.3 - 277.7/286.5	≥10	No	No
	277.7/286.5 - 277.8/286.6	≥20	No	No
	281.6/290.4 - 281.7/290.5	3-5	Yes	No
Sacramento Mainline	1.0 - 6.4	20	Yes	No
	7.5 - 7.9	4	Yes	No
	10.8	1	Yes	No
	12.8 - 13.2	3	Yes	No
	13.6	1	Yes	No
	14.2	1	Yes	No
	15.7 - 17.3	3	Yes	No
	17.3 - 17.6	0 - 8	Yes	No
	18.0 - 22.3	9	Yes	No
	23.2	1	Yes	No
	25.2 - 26.4	31 - 60	Yes	No
	31.3 - 35.5	16	Yes	No
	37.4	1	No b/	No b/
	41.1	1	No b/	No b/
	42.9	1	No b/	No b/
	45.0 - 46.0	1	No	Yes
	48.6 - 49.2	5	No	Yes
	49.6	1	No	Yes
	50.3	1	No	Yes
	51.4 - 54.0	17	No	Yes
	57.8 - 58.1	8 - 15	Yes	No
	61.2 - 61.9	≥35	Yes	No
Lindsay Segment	1.1 - 1.3	2	Yes	No
	2.4	1	Yes	No
	4.0	1	Yes	No
	6.8 - 7.9	3	Yes	No
	11.2	2	Yes	No
	12.6	1	Yes	No
	13.6 - 14.9	11	Yes	No
	16.4 - 16.5	0 - 5	Yes	No
	16.8	1	Yes	No
	17.1	1	Yes	No

TABLE 4.7.1.1-3 (cont'd)

Pipeline Segment	Approximate Mileposts	Number of Residences a/	Pipeline within Street Easement	Pipeline within Railroad Easement
Coalinga Segment	2.3	1	No	Yes
	9.8	1	No	Yes
	10.8 - 11	5 - 10	No	Yes
	16.4 - 16.9	13 - 25	No	Yes
	19.5	1	No	Yes
	20.2 - 20.4	≥10	No	Yes
	21.1 - 21.9	≥40	No	Yes
	40.1 - 40.4	8 - 15	No	Yes
Sanger Segment	0.3 - 0.4	2	Yes	No
	1.0 - 2.1	12	Yes	No
	2.6 - 2.7	2	Yes	No
	3.2 - 5.2	12	Yes	No
	6.4 - 9.1	12	Yes	No
	9.2 - 9.5	0 - 15	Yes	No
Ceres Segment	0.4 - 0.8	8	Yes	No
	1.7	2	No	Yes
Modesto B Segment	1.0 - 1.7	≥ 35	Yes	No
Tracy Segment	0.0	1	Yes	No
	0.5 - 1.1	0 - 15	Yes	No
	1.4 - 1.8	11 - 20	Yes	No
	3.8 - 4.0	5 - 10	No	Yes
Palo Alto Segment	0.2	1	Yes	No
	1.0	1	Yes	No
	2.0	1	Yes	No
	14.2	2	Yes	No
	14.7	1	Yes	No
	23.4 - 23.7	8 - 15	Yes	No
	23.9 - 24.2	≥10	Yes	No
	25.4 - 25.6	≥10	Yes	No
	29.3	1	Yes	No
	34.9 - 37.9	≥150	No	Yes
	38.3	0 - 25	No	Yes
	39.0 - 40.9	≥90	No	Yes
	41.2 - 42.0	21 - 40	No	Yes
	42.0 - 49.0	≥350	No	Yes
Antioch Segment	1.4 - 1.7	≥25	Yes	No
Fremont Segment	10.7 - 15.6	≥245	No	Yes
Loop 1	14.8	1	No	Yes
Loop 2	1.1	1	No	Yes
Loop 3	0.6	1	No	Yes
Loop 4	1.9	1	No	Yes
	2.4	1	No	Yes
	5.8	1	No	Yes

TABLE 4.7.1.1-3 (cont'd)

Pipeline Segment	Approximate Mileposts	Number of Residences a/	Pipeline within Street Easement	Pipeline within Railroad Easement
Additional Facilities Serve Alternative Customer Group 1				
Oakland Segment	1.0	1	No	No
	3.5 - 3.6	2	Yes	No
	4.5 - 4.6	3	Yes	No
	4.9 - 5.4	≥25	Yes	No
	6.1 - 7.4	≥65	No	Yes
	11.4 - 11.7	≥15	Yes	No
	18.2 - 18.4	0 - 5	Yes	No
	18.8 - 19.3	7	Yes	No
	19.5 - 20.4	23 - 45	Yes	No
	20.5 - 20.7	2	Yes	No
	20.7 - 22.5	47 - 90	Yes	No
	22.8 - 24.9	0 - 53	Yes	No
	24.9 - 25.6	18 - 35	No	Yes
	27.7 - 28.0	8 - 15	No	Yes
Turlock A Segment	0.1 - 0.95	0 - 43	Yes	No
	1.8 - 3.1	6	Yes	No
Lathrop Segment	0.0 - 1.8	9	Yes	No
	1.8 - 2.1	0 - 8	Yes	No
	2.1 - 2.7	3	Yes	No
	2.7 - 3.1	0 - 10	Yes	No
	3.1 - 3.3	2	Yes	No
	3.3 - 3.9	≥30	Yes	No
	4.2 - 4.9	≥35	Yes	No
	5.1 - 5.6	≥25	Yes	No
	5.7 - 6.0	0 - 8	Yes	No
	7.4 - 8.1	18 - 35	Yes	No
Additional Facilities Serve Alternative Customer Group 2				
Lindsay Alternative	23.9	1	Yes	No
	24.5	1	Yes	No
	26.5 - 26.6	2	Yes	No
	27.3	1	Yes	No
	27.8	11	Yes	No
	31.2 - 32.9	18	Yes	No
	34.2 - 35.7	11	Yes	No
	36.5	1	Yes	No
	37.3	11	Yes	No
	38.3 - 38.7	2	Yes	No
	42.4	1	Yes	No
Madera Segment	0.2	1	Yes	No
	4.9	1	Yes	No
Fairmead Segment	0.3	1	Yes	No
	2.7	1	No	No

TABLE 4.7.1.1-3 (cont'd)

Pipeline Segment	Approximate Mileposts	Number of Residences a/	Pipeline within Street Easement	Pipeline within Railroad Easement
Turlock Segment	0.3 - 1.0	3	No	Yes
Sacramento A-159 Segment	0.0 - 1.7	5	No	No
Tracy Segment	1.3 - 1.8	0 - 13	Yes	No
Tracy A-161 Segment	0.8	1	Yes	No
Antioch A-174 Segment	1.4 - 4.0	68 - 130	No	Yes
Hunters Point Segment	3.8 - 5.2	37 - 70	No	Yes
	8.4 - 9.4	0 - 25	Yes	No
	13.2 - 14.3	≥55	Yes	No
	27.6 - 29.6	≥100	Yes	No

---

a/ Single numbers are actual numbers of residences; ranges are derived from residence densities and distances between MPs using the following densities: low = 0-25 units/mile; medium = 26-50 units/mile; and high = >50 units/mile.

b/ Proposed route will be within existing utility-power line right-of-way.

TABLE 4.7.3-1

Recreation and Public Interest Areas Crossed By or Near the Proposed Route

Pipeline Segment and Milepost	County	Recreation/Public Interest Area	Crossing Length (miles)	Comments
Core Project				
North Mainline				
105.7/114.2	Fresno	Konkel School	0.1	Railroad ROW separates school from proposed route.
112.4/120.9	Fresno	Roeding Park and Chassee Zoological Gardens	0.7	Park/Zoo in City of Fresno; four-lane highway separates park/zoo from proposed route.
120.8/129.4	Fresno	Proposed San Joaquin River Parkway	0.2	Parkway would be from State Route 99 east to Friant Dam; pipeline would be bored under the river.
191.6/200.3	Stanislaus	Fairgrounds	0.4	Located in City of Turlock.
252.7/261.3	Alameda, Contra Costa	Los Vaqueros Reservoir Project, Brushy Peak, Vasco Caves (EBRPD, CCWD, LARPD)	7.8	Proposed route is adjacent to east edge of grounds along RR ROW; future preservation/recreation area crossed adjacent to future Los Vaqueros Reservoir.
268.8/277.5	Contra Costa	Black Diamond Mines Regional Preserve (EBRPD-operated, BOR-owned)	1.0	0.9 mile of trails paralleled.
269.8/278.6	Contra Costa	Contra Loma Regional Park (EBPRD-operated, BOR-owned)	1.0	0.2 mile of trails paralleled.
276.1/284.9	Contra Costa	Delta View Golf Course	1.0	Located in City of Pittsburg; proposed route crosses east side of property.
Fremont Segment				
8.7	Alameda	Sportsfield Park	0.3	Located in City of Newark; proposed route crosses south edge of park along RR ROW.
10.7	Alameda	Civic Center Park	0.2	Located in City of Newark; proposed route crosses south edge of park along road ROW.
12.2	Alameda	Norris School	0.1	Located in City of Fremont; proposed route crosses south edge of school yard within Baine Avenue ROW.
13.7	Alameda	Alameda Creek Quarries Regional Park (EBRPD)	1.5	Road and RR ROW separate park from proposed route.

TABLE 4.7.3-1 (cont'd)

Pipeline Segment and Milepost	County	Recreation/Public Interest Area	Crossing Length (miles)	Comments
Palo Alto Segment				
6.3	Alameda	Sycamore Grove Park (LARPD)	0.4	Proposed route crosses areas of scattered trees along existing power ROWs.
18.8	Alameda	Mission Peak Regional Preserve/Sonol Regional Wilderness (EBRPD)	2.5	Proposed route crosses Mission Peak preserve adjacent and to the west of Sonol Regional Wilderness along crest of hill.
19.0	Alameda	Ohlone Wilderness Trail (EBRPD)	0.0	Proposed route crsses designated trail within Mission Peak regional preserve.
25.6	Santa Clara	Golf Course	0.5	Proposed route crosses golf course within City of Milpitas.
26.2	Santa Clara	San Francisco Bay National Wildlife Refuge (USFWS)	1.0	Proposed route is within 0.1 mile east of refuge.
26.2	Santa Clara	Coyote Creek Trail (Santa Clara County Parks Dept.)	2.2	Proposed route parallels this multi-use recreation trail along levee; located in City of Santa Clara.
35.8	Santa Clara	Bracher Park	0.1	Proposed route crosses northern edge of park along RR ROW.
41.5	Santa Clara	Stevens Creek Park Chain	0.1	Creekside park located in City of Mountain View.
43.0	Santa Clara	Rengstorff Park	0.2	Located in City of Mountain View; RR ROW separates park from proposed route.
46.1	Santa Clara	Bowden Park	0.1	Located in City of Palo Alto; proposed route crosses south edge along RR ROW.
46.5	Santa Clara	Peer's Park	0.1	Located in City of Palo Alto; RR ROW separates park from proposed route.
46.9	Santa Clara	Palo Alto High School	0.2	Proposed route crosses east edge of school yard along Churchill Avenue ROW.
47.2	Santa Clara	Stanford University Stadium	0.6	Proposed route crosses north and west edges of stadium along El Camino Real and Stanford campus road.
Loop 4				
0.0	San Bernardino	Sycamore Canyon Golf Club	0.6	Existing pipeline ROW separates golf course from proposed route.

TABLE 4.7.3-1 (cont'd)

Pipeline Segment and Milepost	County	Recreation/Public Interest Area	Crossing Length (miles)	Comments
Additional Facilities to Serve Alternative Customer Group 1				
Oakland Segment				
0.0	Alameda	Sycamore Grove Park (LARPD)	0.7	Proposed route crosses park along dirt road ROW.
4.2	Alameda	Shadow Cliffs Regional Recreation Area (EBRPD)	0.1	Proposed route crosses south edge of recreation area along East Vineyard Road ROW.
10.7	Alameda	Rowell Ranch Rodeo Park (Hayward Area Recreation and Park District)	0.1	Proposed route crosses north edge of park along Dublin Canyon Road ROW.
19.5	Alameda	Cull Canyon Regional Recreation Area	0.1	Proposed route crosses southern portion of recreation area within Heyer Road ROW.
20.6	Alameda	Castro Valley High School	0.1	Proposed route crosses south edge of school yard within Redwood Road ROW.
21.8	Alameda	Stanton School	0.1	Proposed route crosses south edge of school yard within Somerset Avenue ROW.
26.8	Alameda	Thrasher Park	0.1	RR ROW separates park from proposed route.
29.4	Alameda	Oakland-Alameda Coliseum Complex	0.5	RR ROW separates Coliseum property from proposed route.
Additional Facilities to Serve Alternative Customer Group 2				
Antioch A-174 Segment				
1.6	Contra Costa	Contra Costa County Fairgrounds	0.3	Located in City of Antioch; proposed route crosses south edge of fairgrounds along RR ROW.

TABLE 4.7.3-1 (cont'd)

Pipeline Segment and Milepost	County	Recreation/Public Interest Area	Crossing Length (miles)	Comments
Hunters Point Segment				
1.0	Santa Clara	El Camino Park	0.3	Located in City of Palo Alto; RR ROW separates park from proposed route.
1.6	Santa Clara	Burgess Park	0.2	Located in City of Menlo Park; proposed route crosses west edge of park along RR ROW.
2.8	Santa Clara	Holbrook-Palmer Park	0.1	Located in City of Atherton; RR ROW separates park from proposed route.
3.5	Santa Clara	Garfield School	0.3	Located in City of Atherton; RR ROW separates school from proposed route.
10.7	San Mateo	Bay Meadows Racetrack	0.7	Located in City of San Mateo; proposed route crosses south edge of property along RR ROW.
11.7	San Mateo	Trinta Park	0.2	Located in City of San Mateo; proposed route crosses northern edge of park along RR ROW.
14.6	San Mateo	Washington Park and Burlingame High School	0.4	Located in City of Burlingame; proposed route crosses south edge of property along RR ROW.
19.4	San Mateo	Belle Air School and Lion's Field	0.1	Located in City of San Bruno; proposed route crosses north edge of schoolyard along RR ROW.
22.6	San Mateo	San Bruno Mountain State and County Park	1.5	U.S. 101 and RR ROW separate park from proposed route.
26.0	San Francisco	Candlestick Cove School	0.4	Located in City of San Francisco; Beatty Road ROW separates school from proposed route for 0.2 mile; proposed route crosses schoolyard for 0.2 mile along U.S. 101 ROW.
26.9	San Francisco	Candlestick Park Stadium, entrance to Candlestick Point State Recreation Area	0.4	Jamestown Road ROW separates stadium and entrance to Recreation Area from proposed route.
27.8	San Francisco	Bay View Playground	0.1	Third Street separates playground from proposed route.

ROW	=	Right-of-Way.	CCWD	=	Contra Costa Water District.
RR	=	Railroad.	EBRPD	=	East Bay Regional Park District.
BOR	=	U.S. Bureau of Reclamation.	LARPD	=	Livermore Area Regional Park District.

4.8 SOCIOECONOMICS

The economic bases of the counties in the project area differ significantly. Agriculture is an important economic sector in Kern, Tulare, Fresno, Kings and Merced Counties. Stanislaus and San Joaquin Counties have fairly diversified economies with relatively strong agricultural, trade, government, and manufacturing sectors while San Francisco Bay Area counties have grown increasingly dependent on the retail trade and services sectors (Kavanagh, 1994, and Thommen, 1994, personal communications).

Population densities also vary widely from the densely settled urban San Francisco, San Mateo, San Jose, Santa Clara, and Alameda Counties to the more sparsely populated Kings, Merced, and Tulare Counties. Table 4.8-1 gives population statistics for the counties crossed by the proposed route. Santa Clara County is the most populous county, followed by San Bernardino, Alameda, and Sacramento Counties, each with over one million residents. Urban counties such as San Francisco and San Mateo have over 1,000 people per square mile whereas many of the Central Valley and Mojave Desert counties have much lower population densities, often below 100 people per square mile. Similarly, the potentially affected communities vary from the large urban centers of San Jose, Sacramento, Fresno, and Bakersfield with populations in excess of 100,000 to midsized cities such as Barstow, Ceres, Tracy, and Tulare with populations of 20,000 to 40,000 and the small towns such as Needles with populations of less than 10,000.

Table 4.8-1 also gives employment and income information for the counties crossed by the proposed route. Commensurate with their large population bases, Santa Clara, Alameda, San Bernardino, and Sacramento Counties have relatively large civilian labor forces. Mid-1992 unemployment rates in Bay Area counties ranged from a low of 5.5 percent in San Mateo County to a high of 7.3 percent in Contra Costa County. The Central Valley and Mojave Desert communities had higher unemployment rates with mid-1992 rates ranging from a low of 10.2 percent in San Bernardino County to a high of 15.1 percent in Tulare County (EDD, 1992). Per capita personal income levels follow a similar pattern with levels in the Bay Area among the highest in California, ranging from $21,852 in Alameda County to $29,550 in San Francisco County. The Central Valley and Mojave Desert counties have lower income levels, ranging from $13,403 in Merced County to $19,258 in Sacramento County (California Franchise Tax Board, 1992).

Table 4.8-2 gives housing and visitor accommodation information for communities crossed by the proposed route. Vacancy rates for rental units range from a low of 4.0 percent in Manteca and Merced to a high of 11.8 percent in Barstow. Nonlocal pipeline and compressor station construction crews are likely to use visitor accommodations including hotel/motel units, recreational vehicle (RV) sites, and campsites because of the short-term nature of the project construction. Some of these workers would, however, take short-term rentals strategically located to minimize commute distances and moves during the construction phase.

The estimates of available hotel/motel rooms are conservative because they are based only on those hotels and motels that are members of the hotel and motel association or local chambers of commerce or that are approved by the California Automobile Association. Additional temporary lodgings would be available at other hotels and motels. There are considerable visitor accommodations in most of the large communities such as Sacramento, Fresno, Bakersfield, Modesto, Merced, and San Francisco Bay Area cities. Hotel/motel vacancy rates in Bay Area counties ranged from 18 to 27 percent in 1988. The rates are higher in the Central Valley, over 27 percent for Fresno and San Joaquin Counties and around 35 percent for Sacramento County. Vacancy rates

TABLE 4.8-1

Socioeconomic Data for Counties Affected by the Project

County	Population (1990 Census) a/	Population Density (people/sq. mi.)	August 1992 Civilian Labor Force b/	August 1992 Unemployment Rate (percent) b/	1991 Per Capita Income (1991 $) c/
Alameda	1,279,182	1,734.5	706,800	6.8	21,852
Contra Costa	803,732	1,115.8	437,600	7.3	26,215
Fresno	667,490	111.9	346,600	12.8	16,323
Kern	543,477	66.8	273,000	14.2	15,791
Kings	101,469	73.0	39,475	14.4	13,419
Madera	88,090	40.9	NA	15.7	13,553
Merced	178,469	92.5	78,825	13.8	13,403
Sacramento	1,041,219	1,078.2	572,600	7.9	19,258
San Bernardino	1,418,380	70.7	633,600	10.2	15,919
San Francisco	723,959	15,502.3	415,300	7.3	29,550
San Joaquin	480,628	343.5	222,000	12.4	15,582
San Mateo	649,623	1,446.5	377,700	5.5	28,993
Santa Clara	1,497,577	1,159.8	851,600	6.9	25,955
Stanislaus	370,522	247.9	194,800	13.5	15,221
Tulare	311,921	64.7	NA	15.1	14,248

---

a/ U.S. Department of Commerce, 1992.
b/ EDD, 1992, as cited in WCC, 1994.
c/ California Department of Finance, 1993.
NA = Not available.

TABLE 4.8-2

Housing Information for Selected Communities Along the Proposed Route

Community	Population (1990 Census) a/	Total Housing Units a/	Rental Housing Units a/	Rental Vacancy Rate (Percent) a/	Estimated Hotel/Motel Rooms b/
Antioch	62,195	22,973	8,361	8.7	191
Bakersfield	174,820	66,175	29,998	6.5	2,700 c/
Barstow	21,454	8,548	4,085	11.8	1,628 c/
Ceres	26,314	9,075	3,195	5.4	NA
Concord	111,348	41,940	17,290	5.3	1,129
Fresno	354,202	129,404	67,451	6.5	3,054
Livermore	56,741	41,940	7,234	6.2	221
Manteca	40,773	13,981	5,793	4.0	101
Merced	56,216	18,965	10,543	4.0	251
Modesto	164,730	60,878	25,448	5.4	1,093
Mojave	3,763	1,530	729	7.1	391 c/
Needles	5,506	2,449	973	8.2	800 c/
Sacramento	369,395	153,362	75,243	6.5	5,187
San Jose	782,248	250,218	101,433	4.5	4,370
Stockton	210,943	72,525	37,408	5.3	1,014
Tracy	33,558	12,174	4,698	4.7	119
Tulare	33,249	11,319	4,902	4.7	183
Turlock	42,198	15,400	7,324	4.8	259
Visalia	75,636	27,154	10,805	4.6	934 c/

---

a/ U.S. Department of Commerce, 1992.

b/ Automobile Association of America, 1994.

c/ Bakersfield Convention Bureau, Barstow Chamber of Commerce, Needles Chamber of Commerce, and Visalia Convention Bureau, personal communications, 1994, and Mojave Chamber of Commerce, 1993, as cited in WCC, 1994.

fluctuate seasonally. Peak tourist season and special events such as county fairs, athletic events, and conventions can significantly reduce the available visitor accommodations.

Public services such as medical care and police and fire protection are available throughout the state but are concentrated in the more densely populated areas. Larger cities typically provide police and fire protection, and hospitals, schools, water, sewer, and other utilities are available. In unincorporated and rural areas, the county generally provides services such as a sheriff, but fire protection may be provided by a volunteer fire department or California State Department of Forestry firefighting unit. Most of the proposed route passes through unincorporated parts of the 13 counties crossed.

All secured property (land and structures) in California is taxed at 1 percent of total assessed value; the tax is collected by the county where the property is located. Additional assessments and taxes are levied by local governments including franchise fees for passing through table 4.8-2 the local rights-of-way of existing natural gas pipelines. Local sales and payroll taxes vary by locality.

4.9 CULTURAL RESOURCES

4.9.1 Background

In March 1993, Mojave submitted a report of a cultural resources overview (Overview) to the FERC, SLC, California State Historic Preservation Office (SHPO), and the BLM, representing all of the cooperating Federal land management agencies. The Overview is equivalent to a BLM Class I type study. The information below was summarized from the subsequently amended Overview. Mojave later conducted a more detailed cultural resources inventory, which is described in section 4.9.2.

4.9.1.1 Cultural Contexts

The proposed pipeline would cross prehistoric culture areas that generally correspond to three major physiographic regions in California. A small portion of the project would be within the Mojave Desert subarea of the Great Basin culture area. Most of the project facilities would be in the Central Valley and San Francisco Bay subareas of the Central California culture area. Archaeologists have created chronologically sensitive contexts for these subareas by linking similar series of attributes including artifact assemblages and activity patterns into definable cultural periods, traditions, horizons, phases, or complexes.

Prehistory

The Mojave Desert culture area has been subdivided into the following cultural stages or periods: Western Pluvial Lakes Tradition of the Paleo-Indian period (ca. 12,000 B.C. to 5500 B.C.); Pinto period (ca. 5500 B.C. to 2000 B.C.); Gypsum period (ca. 2000 B.C. to A.D. 500); Saratoga Springs period (ca. A.D. 500 to A.D. 1200); and Shoshonean period (ca. A.D. 1200 to contact). The Central California culture area has been subdivided into the following cultural stages: Western Pluvial Lakes Tradition (ca. 12,000 B.C. to 6000 B.C.); unnamed phase (ca. 6000 B.C. to 2500 B.C.); Early Horizon period/Windmiller Pattern (ca. 2500 B.C. to 1000 B.C.); Middle Horizon period/Berkeley Pattern (ca. 1000 B.C. to A.D. 500); and Late Horizon period/Augustine Pattern (ca. A.D. 500 to contact).

Ethnohistory

At the time of initial contact with Europeans, the Mojave Desert was used as a hinterland by several Native American tribes including the Western Shoshone, Southern Pauite-Chemehuevi, Mojave, Serrano, Vanyume, and Kawaiisu. The San Joaquin Valley was historically dominated by the Yokut. Combined, the three main Yokut divisions, Southern, Northern, and Foothill, totalled about 60 tribelets or independent bands.

The lower Sacramento Valley supported the Nisenan and Eastern Miwok tribes. The Nisenan, a southern subdivision of the Maidu linguistic group, settled around the American River. The Eastern Miwok consisted of two main subdivisions: the Plains Miwok with at least 28 tribelets whose territory extended from the Sacramento to the Calaveras River and the Bay Miwok who lived on the south side of Suisun Bay between Mt. Diablo and the Sacramento River Delta.

The San Francisco Bay Area was the homeland for the Costanoan people, now referred to as the Ohlone, who were subdivided into at least 50 tribelets. Most of the California coastal groups were devastated by missionization, introduction of foreign disease, and the consequences of the Gold Rush so little is known of their original cultural lifeways.

History

The history of California can be divided into three main cultural/political periods: the Spanish period (ca. A.D. 1492 to 1821); the Mexican period (1821 to 1848); and the American period (after 1848). During the American period, the following socioeconomic events or patterns influenced historic settlement and resources in the project area: expansion of railroads (ca. 1861 to 1909); construction of irrigation and water systems (ca. 1850 to 1950); agricultural development (ca. 1850 to 1950); and urbanization (ca. 1850 to 1950).

4.9.1.2 Results of Previous Investigations

The Overview summarized data from six different information centers of the California Historical Resources File System and the SHPO including information on previously recorded historic and prehistoric sites, California Historic Landmarks, Points of Historical Interest, and historic standing structures. In addition, General Land Office plats, Sanborn Fire Insurance Company maps, and records of the California Railroad Commission were examined to identify potential historic sites in the project area.

History of Research

California archeology dates back to the turn of the century. As early as 1910, N.C. Nelson was investigating sites along the Hunters Point Segment including excavations at the Crocker Mound or Bayshore Site (SFR-7). In the 1950s, A.E. Treganza recorded sites along the proposed Sacramento Mainline including Sites CA-SJO-100 and CA-SJO-102 as part of a River Basins survey. Most of the archeological work in the project area, however, has been conducted during the last 30 years. The Overview indicated that about 200 cultural resources surveys were previously conducted in parts of the project area, but most were limited in scope and did not overlap major portions of the proposed route.

Large Block Surveys in the Project Area

Table 4.9.1.2-1 lists the areas crossed by the proposed route that were examined during previous cultural resource inventories. Because all regulatory review and compliance were completed, these areas, totalling about 119 miles, did not need to be reexamined for this project.

Previously Recorded Sites

The Overview identified 584 known sites within a 1-mile-wide study corridor. Of these, 106 resources were thought to be within approximately 200 feet of the proposed project facilities. During the inventory, 23 of the previously recorded sites were identified within the survey area.

TABLE 4.9.1.2-1

Areas Along Proposed Route Previously Inventoried for Cultural Resources

Pipeline Segment and Mileposts	Length	Iventory	Project
Loop 1 (Mojave Mainline), MP 50 - 65.5	15.5 miles	McGuire (1990)	Mojave Mainline
Loop 2 (Mojave Mainline), MP 65.5 - 102.2 (Mojave Mainline)	36.7 miles	McGuire (1990)	Mojave Mainline
Loop 3 (Commonline), MP 19.1 - 45	22.9 miles	McGuire (1990)	Mojave Mainline
Loop 4 (East Side Lateral), MP 0 - 25	25 miles	McGuire (1990)	Mojave Mainline
North Mainline, MP 0 - 10.2	10.2 miles	McGuire (1990)	Mojave Mainline
Tracy Segment A-161, North Mainline MP 232.2 - Tracy B Meter Station	1.9 miles	Moratto (1990)	PGT/PGE Project
Engineering Route Alternative A-143, North Mainline MP 251-5 - 258.9	6.9 miles	Bramlette (1991)	Los Vaqueros Reservoir

Note: References are cited in WCC, 1993c.

4.9.2 Inventory Results

In August 1994, Mojave submitted its cultural resources inventory report to the FERC, SLC, BLM, and SHPO. The report, which is equivalent to a BLM Class III type study, documents the results of a cultural resources survey of the locations of most of the proposed facilities. About 200 of the 764 miles surveyed were covered by a walking inspection of a corridor that was 200 feet wide. Because of lack of access off the right-of-way or other constraints, the survey was restricted for 378 miles to the width of the area of potential effect (APE), i.e., the 30- to 75-foot-wide construction right-of-way. For 113 miles, it was restricted to less than the width of the APE. About 72 miles of built environment, i.e., towns or cities with paved streets and dense clusters of standing structures, where the pipeline would be within railroad or road rights-of-way were covered by a windshield or drive-by-survey. About 100 miles of the route were not surveyed because access was denied or because of other factors.

4.9.2.1 Archeological and Historic Sites

The inventory report listed all cultural resources found during the survey and identified which resources might be affected by the project, whether the significance of the resource was evaluated, and, if so, what it was. Recommendations for future work were also included. Table 4.9.2.1-1 gives the numbers of sites identified in the survey area. Excluding railroad track sites, the inventory identified 154 historic sites, 18 prehistoric sites, and 5 multicomponent sites, i.e., sites containing both historic and prehistoric components. Some of these sites could be affected by more than one project segment. The sites with prehistoric components include 12 middens, 6 lithic scatters, 3 bedrock mortar stations, and 2 quarries. Many of the historic sites are linear in nature including 67 irrigation canals or water systems; 59 historic sites are farm buildings, houses, or house remains.

The project would cross historic railroads 115 times. These crossings can be grouped into 23 different railroad systems or site depending on when the lines were originally constructed and by whom. Railroad-related sites include depots, station sidings, section house remains, and construction camps.

4.9.2.2 Traditional Cultural Properties

In April 1993, in an attempt to identify traditional cultural properties in the project area, Mojave sent information packets to Native Americans whose names were furnished by the California Native American Heritage Commission. In February and March 1994, because of the two amendments to its FERC application, Mojave sent out two more mailings with updated information summarizing proposed additional or modified facilities. Table 4.9.2.2-1 lists the 82 individuals contacted along with their tribal affiliations and concerns.

In addition to the mailings, Mojave followed up on telephone inquiries and arranged the requested personal meetings. Mojave attended a meeting of the Kern County Native American Heritage Preservation Council in August 1993 and separate meetings in April 1994 with representatives of the Ione Band of Miwok Indians, Sacramento Valley tribes, San Francisco Bay Area tribes, and San Joaquin Valley tribes.

TABLE 4.9.2.1-1

Sites Identified Within the Survey Corridor a/

Proposed Pipeline Facility	Number of Sites Crossed b/ Prehistoric	Historic	Multicomponent	Total
Core Project				
North Mainline	2	66 (3)	0	68
Sacramento Mainline	2	26 (1)	2	30
Lindsay Segment	0	7	0	7
Coalinga Segment	1	10 (1)	1	12
Sanger Segment	0	6 (2)	0	6
Livingston Segment	0	0	0	0
Ceres Segment	0	1	0	1
Modesto B Segment	0	0	0	0
Tracy segment	0	2	0	2
Palo Alto segment	1	2	2	5
Antioch Segment	0	1 (1)	0	1
Fremont Segment	0	0	0	0
Loop 1	0	2 (1)	0	2
Loop 2	2	4 (1)	0	6
Loop 3	3	1	0	4
Loop 4	0	0	0	0
Additional Facilities to Serve Alternative Customer Group 1				
Kingsburg Segment	0	0	0	0
Turlock A Segment	0	1	0	1
Lathrop Segment	0	13	0	13
Oakland Segment	3	1	0	4
Additional Facilities to Serve Alternative Customer Group 2				
Lindsay Alternative Segment	0	6	0	6
McFarland Segment	0	0	0	0
Malaga Segment	0	0	0	0
Madera Segment	0	4	0	4
Fairmead Segment	0	2	0	2
Turlock Segment (A-154)	0	0	0	0
Ripon Segment	0	0	0	0
Sacramento (A-159)	0	1 (1)	0	1
Tracy (A-160)	0	0	0	0
Tracy (A-161)	0	0	0	0
Antioch (A-174)	0	1	0	1
Martinez (A-172)	0	0	0	0
Hunters Point Segment	4	8	0	12
San Francisco Segment	0	0	0	0
Compressor Stations				
Topock Compressor Station	0	0	0	0
Amboy Compressor Station	0	1 (1)	0	1
Daggett Compressor Station	0	1 (1)	0	1
Famoso Compressor Station	0	0	0	0
Lindsay Compressor Station	0	0	0	0
TOTAL	18	167 (13)	5	190

---

a/ Excluded from this table are the railroad track sites crossed by the proposed pipeline facilities.

b/ Numbers in parentheses indicate duplicate sites, i.e., sites crossed by more than one facility and consequently counted more than once.

The Overview identified two ethnohistoric Yokut villages along the Coalinga Segment; however, no remains were found during the cultural resources survey. A local informant indicated the possible location of the village of Posa Chana, but nothing was found during an intensive inspection of the location.

Native American concerns generally include avoiding prehistoric archeological sites, appropriately treating any aboriginal burials encountered during project construction, being kept informed of the project's progress, receiving copies of the cultural resources reports, and the hiring of Native Americans. As a result of consultations with Native Americans, Mojave identified 25 sensitive locations.

Table 4.9.2.2-1

Native Americans Contacted

Native Americans Contacted, Tribal Affiliation(s)	Facilities in Historic Tribal Area	Results of Contact
Geraldine Alec, Western Mono	None	No response
Henry Alvarez, Ohlone	a/	No response
Lisa Alvarez, Ohlone	a/	No response
Art Alvitre, Gabrieleno	None	No response
Dorothy Andrews, Miwok	b/	No response
Mary Baugh, Miwok	b/	No response
Debbie Yonemura Burge, Miwok	b/	No response
Esther Burris, Miwok	b/	No response
Harold Burris, Miwok	b/	No response
Pamela Burris, Miwok	b/	No response
Rosemary Cambra, Ohlone/Muwekma	a/	Telephone request for meeting
Ann N. Comnos, Esselen	None	Written request for a copy of cultural resources report and suggested memorandum of understanding for burials
Margaret Dalton, Miwuk	b/	No response
Darlene Daniels, Miwok	b/	No response
Leland Daniels, Miwok	b/	No response
David Dominquez, Chumash	None	No response
Henry Duro, San Manuel Indian Reservation	d/	No response
Dwight Dutschke, Me-Wuk	b/	No response
Daniel Eddie Jr., Colorado River Indian Tribe	d/	No response
Rose Enos, Maidu/Washoe	None	No response
Floyd Franco Jr., Wukchumni	c/	Personal meeting arranged
Bill Franklin Sr., Miwok	b/	No response
Dan and Anita Franklin, Miwok	b/	No response
James Franklin, Miwok	b/	No response
Margaret Ruvalcaba Franklin, Miwok	b/	Hired as monitor during testing along Sacramento Mainline
Teresa Franklin, Miwok	b/	No response
Albert Benjamin Galvan, Ohlone	a/	No response
Andrew Rosalea Galvan, Ohlone	a/	A phone request for more information on sites in Alameda and Santa Clara Counties. Phoned again expressing concerns over Oakland Segment crossing the site of his grandmother's village.
Douglas Galvan, Ohlone	a/	No response
Felipe "Phil" Galvan, Ohlone	a/	No response
Mona Lisa "Potts" Garcia, Miwok/Maidu	b/	No response

Table 4.9.2.2-1 (Cont'd)

Native Americans Contacted, Tribal Affiliation(s)	Facilities in Historic Tribal Area	Results of Contact
Nora Garcia, Fort Mojave Reservation	d/	Written and telephone responses from Weldon B. Johnson Sr., Cultural Resources Dept., Fort Mojave Tribes, recommended use of Native Americans during survey, requested copies of survey reports, and indicated that nothing was found of interest to Fort Mojave Tribes during survey.
Ron Goode, Mono	c/	Written and telephone request for a Native American to accompany archaeological field crews during the survey and for copies of cultural resources reports; suggested plan for curation and repatriation. Also had personal meeting arranged.
Sally Goodwin, Miwok/Wailaki	b/	No response
Andy Greene, Northern Paiute/Kwaiisu	d/	No response
Raymond Hall, Chumash	None	No response
Jill Harvey, Miwok/Maidu	b/	No response
Marion Hood, Wintun	None	No response
Rhonda Hoover, Miwok	b/	No response
Philip Hunter, Yokut	c/	No response
Jakki Kehl, Ohlone	a/	No response
Katherine Galvan Kerr, Ohlone	a/	No response
Dolores Lameira, Ohlone/Muwekma	a/	No response
Julia Lopez, Ohlone/Muwekma	a/	No response
Leonard Manuel Jr., Yokut (Wukchumni, Rancalache, Punkalache, Paiute)	c/	Telephone response expressed concern over stream crossing and requested additional information and meeting.
Marvin Marine, Miwok	b/	No response
Ken Marquis, Ohlone	a/	No response
June Mike, 29 Palms Reservation	d/	No response
Jenny Mousseaux (McLeod), Ohlone	a/	No response
Patrick Orozco, Ohlone	a/	No response
Lorrie Planas, Choinumni/Wobonuch Mono	c/	Written request for information along Sanger Segment.
Alex Ramirez, Ohlone	a/	No response
Redstar, Chumash	None	Written response indicated Mishkandke territory.
Clyde Robinson, Kwaiisu-Shonshone	d/	No response
Concha Rodriguez, Ohlone/Muwekma	a/	No response
Ella W. Rodriguez/Ohlone	a/	Written response indicated concern for burials.
Susie Rodriguez, Ohlone/Muwekma	a/	No response
Norma Sanchez, Ohlone/Muwekma	a/	No response
Anne Marie Sayers, Ohlone	a/	Telephoned expressing concern that Most Likely Descendants be included in any work in archaeological sensitive areas.
Arnold Sewekee, Ohlone/Muwekma	a/	No response
Shingle Springs Rancheria, Miwok/Maipu	b/	Written response indicated no concern.

Table 4.9.2.2-1 (Cont'd)

Native Americans Contacted, Tribal Affiliation(s)	Facilities in Historic Tribal Area	Results of Contact
Linda Shoshone, Washoe Tribe of Nevada and California	None	Written response indicated no concern.
David Snooks, Miwok	b/	No response
Sam Starkey, Maidu/Miwok	b/	No response
Lena Tom Strombeck, Mono/Choinumni	c/	No response
Mary Tarango, Miwok	b/	No response
Keith Turner, Miwok	b/	No response
Fred Velasquez, Miwok	b/	No response
Nicolas Villa Jr., Miwok	b/	Requested meeting
Christine Walker, Chemhuvei	d/	No response
Alvin Walloupe, Miwok	b/	No response
Ron Wermuth, Kwaiisu/ Tubatulabal/Yokut	c/	No response
Agnes Williams, Miwok	b/	No response
Loretta Escobar-Wyer, Esselen	None	Written response requested copy of cultural resources report and suggested memorandum of understanding for burials.
Linda Yamane, Ohlone	a/	No response
Dennis Blue Yonemura, Miwok	b/	No response
Gary Blue Yonemura, Miwok	b/	No response
Laura Yonemura, Miwok	b/	No response
Pat Blue Yonemura, Miwok	b/	No response
Randy Yonemura, Miwok	b/	No response
Pilulaw Khus Zarate, Chumash	None	No response
Irene Zwierlein, Ohlone/Amah	a/	No response

---

a/ Facilities that may be within the traditional territory of the Ohlone/Costanoan tribe include: the North Mainline (MP 214-240), the Sacramento Mainline, and the Antioch, Fremont, Hunter's Point, Oakland, Palo Alto and San Francisco Segments.

b/ Facilities that may be within the traditional territory of the Eastern Miwok tribe include: the North and Sacramento Mainlines and the Antioch and Martinez Segments.

c/ Facilities that may be within the traditional territory of the Yokut tribe include the North and Sacramento Mainlines, Loop 4, the Ceres, Coalinga, Fairmead, Kingsburg, Lathrop, Lindsay, Livingston, Madera, McFarland, Modesto B, Sanger, Turlock A, Turlock, and Tracy Segments, and the Lindsay and Famoso Compressor Stations.

d/ Facilities that may be within the traditional territories of tribes that used the Mojave Desert include Loops 1, 2, and 3 and the Amboy and Daggett Compressor Stations.

4.10 AIR QUALITY AND NOISE

4.10.1 Air Quality

Pipeline construction and compressor station operation could affect air quality. During construction, equipment and fugitive dust emissions could temporarily degrade ambient air quality in the project vicinity. Once in operation, the gas-turbine-driven compressors and internal-combustion engines would emit nitrogen oxides (NO_X), carbon monoxide (CO), sulfur oxides (SO_X) including SO_2 (sulfur dioxide) and SO_4 (sulfates), volatile organic compounds (VOCs), and respirable particulate matter (PM10) from the combustion of natural gas. The stations, whether electric or natural-gas-fired, would also emit VOCs in fugitive emissions from valves and flanges and when the gas pressure is reduced (blowdown) for safety reasons during shutdown of the compressors. The internal-combustion engines would be used to drive backup generators only about 1 hour per week during routine maintenance or during loss of power. The primary pollutant emitted by the stations would be NO_X.

Five air quality management districts would be involved in reviewing and permitting the project. The Amboy and Daggett Compressor Stations and pipeline loops would be in the San Bernardino County portion of the Southeast Desert Air Basin under the jurisdiction of the Mojave Desert Air Quality Management District (Mojave Desert District). The compressor station at either Famoso or Lindsay and part of the new pipeline would be in the San Joaquin Valley Air Basin under the jurisdiction of the San Joaquin Valley Unified Air Pollution Control District (San Joaquin District). Part of the pipeline would be in the Sacramento County portion of the Sacramento Valley Air Basin, which is under the jurisdiction of the Sacramento Metropolitan Air Quality Management District (Sacramento District), and part would be in the San Francisco Bay Area Air Basin, which is under the jurisdiction of the Bay Area Air Quality Management District (Bay Area District). Additional compressor capacity would be added at the Topock Compressor Station in the Mojave County Air Basin under the jurisdiction of the Arizona Department of Environmental Quality (ADEQ).

4.10.1.1 Stationary Source Regulatory Requirements

Ambient air quality is protected by Federal, state, and local regulations. The EPA has developed National Ambient Air Quality Standards (NAAQS) for criteria air pollutants, i.e., ozone, NO_X, CO, SO_2, lead, and PM10, which were identified as hazardous to human health in the Clean Air Act. The air quality standards for each state cannot be less stringent than the NAAQS. The Federal, California, and Arizona Ambient Air Quality Standards (AAQS) are shown in table 4.10.1.1-1. The California AAQS for ozone, PM10, and SO_2 are more stringent than the NAAQS. Within an air basin or part of an air basin where the concentration of a pollutant exceeds the NAAQS, the air basin is designated as nonattainment for that pollutant. If the concentration of a pollutant is below the applicable NAAQS, the air basin or portion of the air basin is designated as attainment for that pollutant. Nonattainment status is classified from moderate through extreme for ozone, CO, or PM10 depending on how much time could be required for the area to reach attainment. Nonattainment for ozone dictates nonattainment for its precursors NO_X and VOCs.

The Federal and state attainment/nonattainment statuses for ozone and PM10 are indicated in figures 4.10.1.1-1 and 4.10.1.1-2, respectively. All of the air basins in the project area are currently in Federal and state attainment for SO_2, SO_4, nitrogen dioxide (NO_2), lead, and hydrogen sulfide. The Southeast Desert Air Basin portion of San Bernardino County is in attainment for carbon monoxide. The Sacramento urban area of the Sacramento Valley Air Basin is in moderate nonattainment for CO. The Bakersfield, Fresno, Modesto, and Stockton urban areas of the San Joaquin Valley Air Basin are

TABLE 4.10.1.1-1

Federal and State Ambient Air Quality Standards

Pollutant	Averaging Period	AAQS ($\mu g/m^3$)		
		Federal	California	Arizona
Carbon monoxide	1 hour a/	40,000	40,000	40,000
	8 hours a/	10,000	10,000	10,000
Nitrogen dioxide	1 year	100	100	100
	1 hour	–	470	–
Ozone	1 hour b/	235	180	235
Total suspended particulates (TSP) c/	24 hours	260	–	150
	1 year d/	75	–	60
Respirable particulate matter (PM10)	24 hours	150	50	150
	1 year d/	50	30	–
Sulfur dioxide	1 hour	–	655	–
	3 hours	1300	–	–
	24 hours	365	131	–
	1 year	80	–	–
Lead	3 months	1.5	–	1.5
Hydrogen sulfide	1 hour	–	42	–
Vinyl chloride	24 hours	–	26	–

---

a/ Not to be exceeded more than once per year.
b/ Not to be exceeded more than 1 day per year based on a 3-year running average.
c/ Standards for TSP have been superseded by PM10; included here for information purposes only.
d/ Geometric mean.
$\mu g/m^3$ = Micrograms per cubic meter.

THIS PAGE INTENTIONALLY BLANK

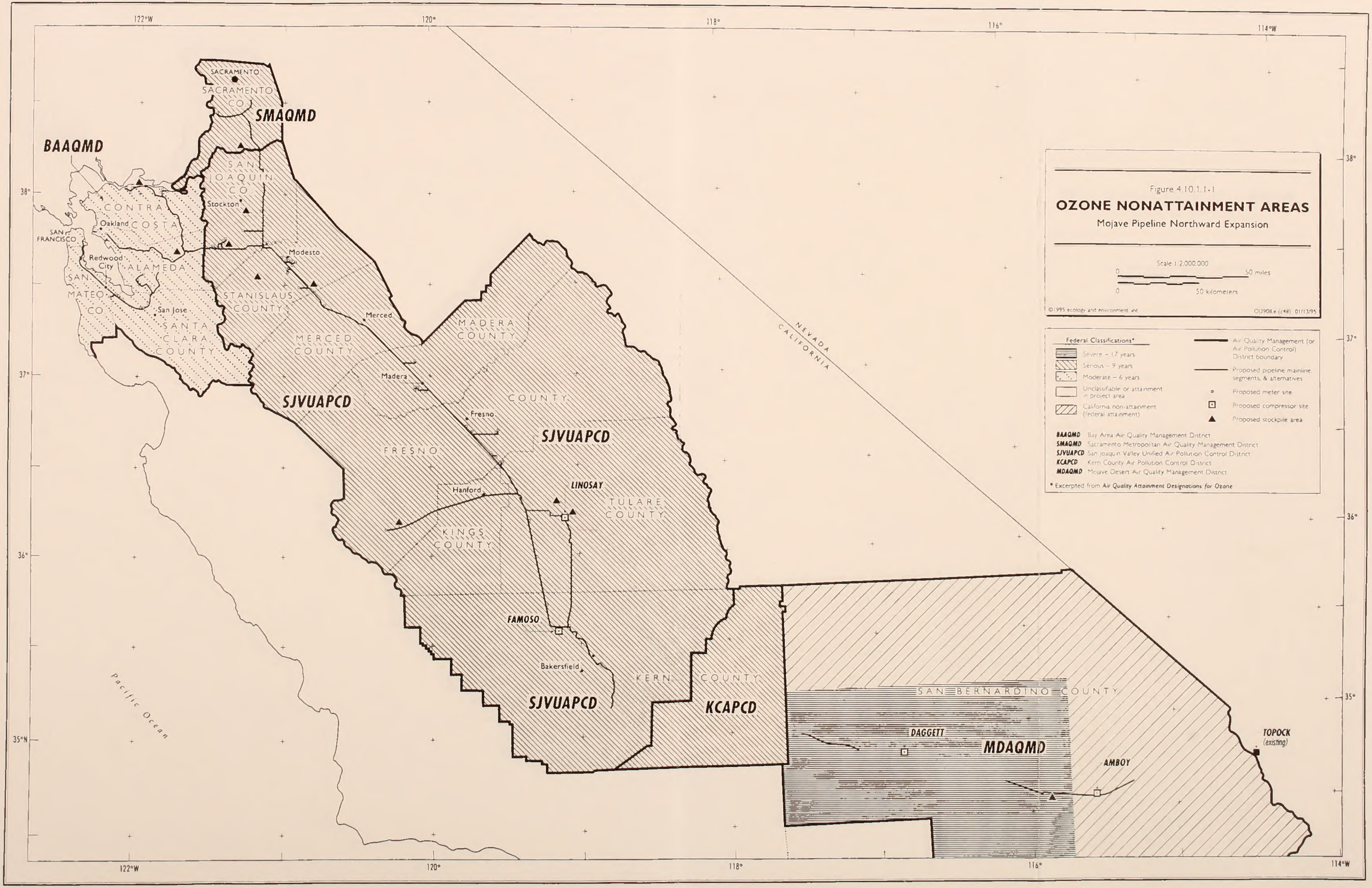


Figure 4.10.1.1-1

OZONE NONATTAINMENT AREAS

Mojave Pipeline Northward Expansion

Scale 1:2,000,000
0
50 miles
0
50 kilometers
©1995 ecology and environment, inc.
O]3908.e (c48) 01/13/95
Federal Classifications*
Severe – 17 years
Serious – 9 years
Moderate – 6 years
Unclassifiable or attainment in project area
California non-attainment (federal attainment)
Air Quality Management (or Air Pollution Control) District boundary
Proposed pipeline mainline, segments, & alternatives
Proposed meter site
Proposed compressor site
Proposed stockpile area
BAAQMD Bay Area Air Quality Management District
SMAQMD Sacramento Metropolitan Air Quality Management District
SJVUAPCD San Joaquin Valley Unified Air Pollution Control District
KCAPCD Kern County Air Pollution Control District
MDAQMD Mojave Desert Air Quality Management District
* Excerpted from Air Quality Attainment Designations for Ozone
122°W
120°
118°
116°
114°W
38°
37°
36°
35°N
35°
SACRAMENTO
SACRAMENTO CO
SMAQMD
BAAQMD
SAN JOAQUIN CO
Stockton
CONTRA COSTA
Oakland
SAN FRANCISCO
Redwood City
ALAMEDA
SAN MATEO CO
San Jose
SANTA CLARA COUNTY
Modesto
STANISLAUS COUNTY
Merced
MERCED COUNTY
MADERA COUNTY
Madera
Fresno
COUNTY
SJVUAPCD
FRESNO
Hanford
LINOSAY
TULARE COUNTY
KINGS COUNTY
FAMOSO
Bakersfield
KERN COUNTY
KCAPCD
NEVADA
CALIFORNIA
SAN BERNARDINO COUNTY
DAGGETT
MDAQMD
AMBOY
TOPOCK (existing)
Pacific Ocean

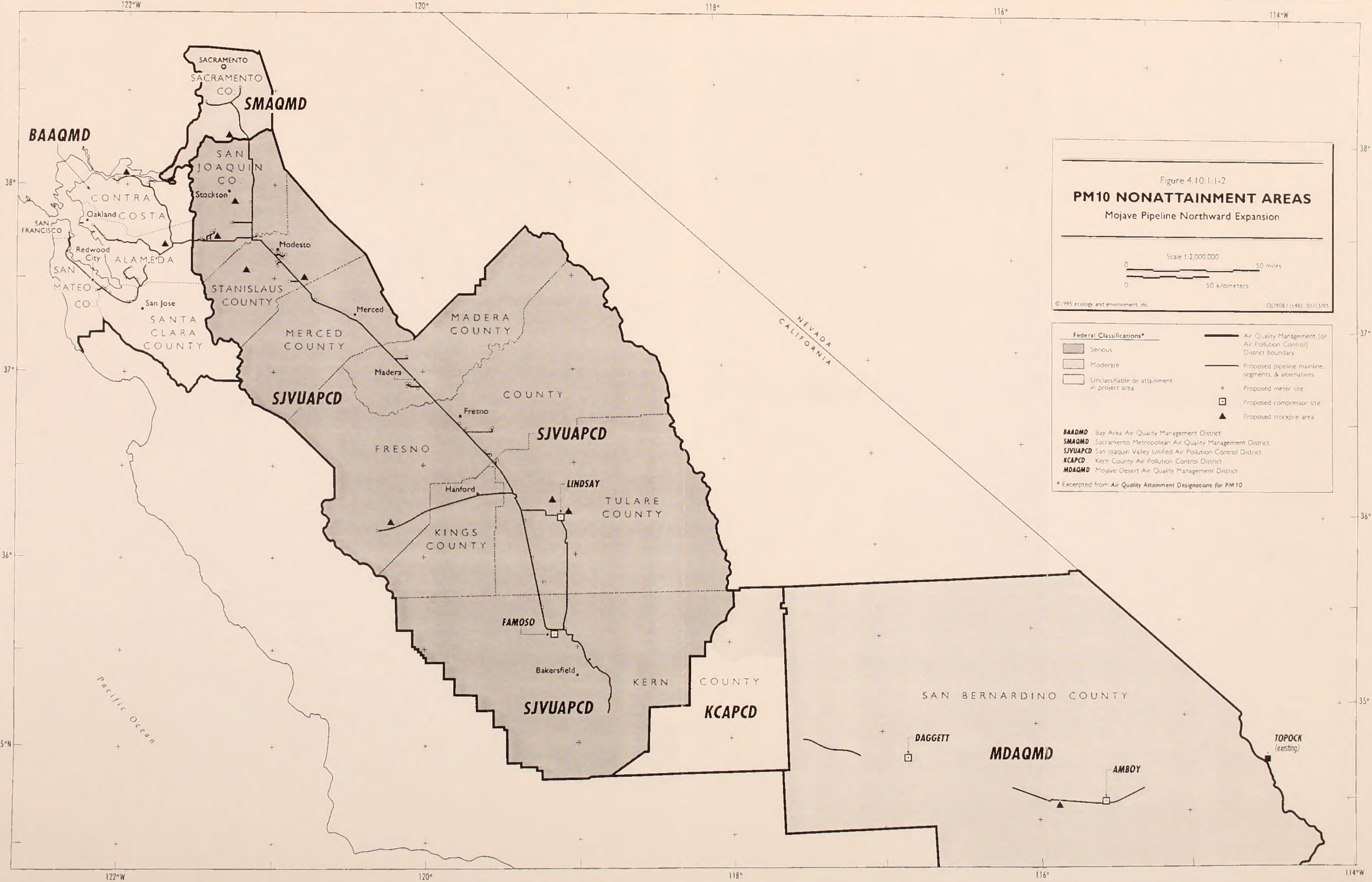


Figure 4.10.1.1-2

PM10 NONATTAINMENT AREAS

Mojave Pipeline Northward Expansion

122°W
120°
118°
116°
114°W
38°
37°
36°
35°N
35°
Scale 1:2,000,000
0
50 miles
0
50 kilometers
©1995 ecology and environment, inc.
OJ3908.f (c48) 01/13/95
Federal Classifications*
Serious
Moderate
Unclassifiable or attainment in project area
Air Quality Management (or Air Pollution Control) District boundary
Proposed pipeline mainline, segments, & alternatives
Proposed meter site
Proposed compressor site
Proposed stockpile area
BAADMD Bay Area Air Quality Management District
SMAQMD Sacramento Metropolitan Air Quality Management District
SJVUAPCD San Joaquin Valley Unified Air Pollution Control District
KCAPCD Kern County Air Pollution Control District
MDAQMD Mojave Desert Air Quality Management District
* Excerpted from Air Quality Attainment Designations for PM10
SACRAMENTO
SACRAMENTO CO.
SMAQMD
BAAQMD
SAN JOAQUIN CO.
Stockton
CONTRA COSTA
Oakland
SAN FRANCISCO
Redwood City
ALAMEDA
SAN MATEO CO.
San Jose
SANTA CLARA COUNTY
Modesto
STANISLAUS COUNTY
Merced
MERCED COUNTY
MADERA COUNTY
Madera
SJVUAPCD
FRESNO COUNTY
Fresno
SJVUAPCD
Hanford
KINGS COUNTY
LINDSAY
TULARE COUNTY
FAMOSO
Bakersfield
KERN COUNTY
SJVUAPCD
KCAPCD
NEVADA
CALIFORNIA
SAN BERNARDINO COUNTY
DAGGETT
MDAQMD
AMBOY
TOPOCK (existing)
Pacific Ocean

in moderate nonattainment for CO. The urban areas of the San Francisco Bay Air Basin are in moderate nonattainment for CO.

The existing air quality at the Topock Compressor Station is protected by prevention of significant deterioration (PSD) regulations, which place specific limits on the impact that new or modified sources of criteria air pollutants may have on existing ambient air quality. These limits are prescribed by air quality increment. An increment is the allowable increase in the ambient concentrations of a pollutant such that there is not significant impact on existing air quality. Every location is assigned either a Class I, II, or III. Class I areas, which are defined as national parks and national wilderness areas, have the smallest allowable increments due their sensitive nature. All attainment areas in Arizona and California are Class II areas except for the areas defined as Class I.

The Topock Compressor Station is 70 miles northeast of the Joshua Tree National Wilderness Area, 24 miles southeast of the proposed East Mojave National Park, and 120 miles southeast of the proposed Death Valley National Park. A PSD review requires that Mojave provide existing ambient air quality data, do computer modeling to show the incremental impact on ambient air quality, do a best available control technology (BACT) analysis, and identify any general environmental impact on air quality. BACT is the available technology that most stringently controls air emissions and that is feasible to use. EPA and the State of California maintain BACT clearinghouses that list prior BACT determinations by equipment type. This information is considered when an agency reviews an applicant's BACT analysis. The proposed BACT has to be at least as stringent a control as that used in prior analyses. For example, the emission of SO_2 and SO_4 is controlled by a maximum gas sulfur content stipulation in the gas delivery contract of 0.75 grain of sulfur per 100 dry standard cubic feet of natural gas (gr S/100dSCF). This has been accepted as the BACT by each of the air districts where gas-fired turbines would be located.

Federal regulations also require that all new or modified sources of criteria air pollutants meet the new source performance standards (NSPS). Title 40, CFR, Part 60, Subpart GG, limits NO_x emissions in the exhaust gases from stationary gas turbines to 150 parts per million by volume (ppmv) based on 15-percent oxygen and a turbine heat rate of 14.4 kilojoules per watt-hour (KJ/W-hr). In nonattainment areas, any additional emissions of criteria pollutants in quantities above the new source review (NSR) thresholds must be mitigated by using offsets. Offsets are credits or quantities of pollutants that are precluded from being emitted by existing sources being shut down or emission controls being installed that are more stringent than required by law. These credits can be bought, sold, and banked in a system administered by local air districts. Offsets are generally not exchanged on a straight ton-per-ton basis because various factors such as distance from source are factored into the amount of proposed additional emissions, which may increase the amount of offsets required. Offsets mitigate new emissions sources by guaranteeing that an equal or greater amount of emissions is removed from the air basin.

Air quality in Federal nonattainment areas is regulated through state implementation plans (SIPs). Each SIP has provisions stating that no new or modified source shall worsen the ambient air quality, i.e., increase air quality violations. Federal nonattainment area regulations are enforced by state and local jurisdiction. Sources of criteria air pollutant emissions would be mitigated and controlled by equipment that incorporates BACT, purchases of offsets equal to or greater than the emissions, or computer modeling to show that the additional emissions would not cause or worsen any violations of AAQS.

THIS PAGE INTENTIONALLY BLANK

The California Clean Air Act requires each air district with jurisdiction over an air basin in nonattainment with California AAQS to prepare a clean air plan that would reduce pollutant emissions 5 percent per year. The plan must specify the measures that would be taken to achieve the reduction.

In addition, each air district has its own regulations governing pollutant sources in nonattainment areas. For example, San Joaquin District Rule 2010 requires an Authority to Construct and a Permit to Operate for a new or modified emissions source. Rule 2201 is a new source review rule that calls for BACT and offsets for stationary sources exceeding certain minimum emission rates. The Mojave Desert District also requires an Authority to Construct and Permit to Operate (Rule 201) as well as NSR with BACT and offsets (Rule 1303).

ADEQ has many rules and regulations affecting sources as described in the Arizona Air Pollution Control Regulations contained in Title 18, Arizona Administrative Rules and Regulations, Chapter 2. These include Article 3 permits and Article 5 performance standards for new and existing stationary sources.

4.10.1.2 Construction Emissions Regulatory Requirements

Each of the four California air districts involved has rules that limit fugitive dust emissions from construction, excavation, and related activities. Each district has unique CEQA guidelines that list the criteria for determining significant unavoidable impact and mitigation measures.

4.10.1.3 Conformity Analysis Regulatory Requirements

A conformity analysis must be conducted if a Federal action would generate emissions that would exceed the conformity thresholds levels (*de minimis*) of the pollutants for which an air basin is in nonattainment. At this time, the FERC staff is exploring how conformity analysis regulations apply to short-term emissions during project construction.

A conformity analysis must show that the emissions would conform to the SIP and would not worsen air quality in the air basin, which could be demonstrated through offsets, SIP provisions, or modeling. Emissions from sources subject to NSR or PSD requirements are exempt and are deemed to have conformed. The requirements for conformity analysis are in Title 40, CFR, Parts 6, 51, and 93, and became effective March 15, 1994.

4.10.2 Noise

The noise associated with the proposed project would be from short-term construction activities or long-term operations. Construction noise would be temporary, localized, intermittent, and limited to daytime hours. During operation, increased noise levels would be experienced by sensitive receptors near the compressor stations. The existing noise environment is summarized in table 4.10.2-1. The intensity and frequency (pitch) of ambient noise may vary over the course of the day depending on the noise source and changing weather conditions. The A-weighted decibel or dB(A) scale corresponds closely with the frequency range of human hearing and is therefore the most commonly used descriptor of community noise. The decibel scale is expressed as either the 24-hour equivalent sound level, Leq (24), or the day-night sound level, Ldn. The Leq (24), is the level of steady sound with the same total (equivalent) energy as the time-varying sound of interest, averaged over 24 hours. The Ldn is

Table 4.10.2-1

Noise-Sensitive Areas Near the Proposed Compressor Stations and Local Noise Standards

	Nearest NSA					
Compressor Station	Distance and Direction From Compressor Station	Type	Most Sensitive Nearby Land Use	Existing L_{dn} in dB(A)	Local Administering Agency	Acceptable Noise Level in dB(A)
Topock	5,200 feet southwest	Single-family residence	Residential	39 c/	None g/	55 dB(A)
Amboy	2,600 feet southwest	Single-family residence	Residential	35 - 40 e/	San Bernadino County, Department of Environmental Health and Safety	55/45dB(A) h/
Daggett	2,600 feet northwest	Single-family residence	Residential	55 d/	San Bernadino County, Department of Environmental Health and Safety	55/45dB(A) h/
Famoso a/	3,300 feet west	Single-family residence	Residential	35 - 40 e/	Kern County	60 dB(A)
Lindsay b/	500 feet west	Single-family residence	Residential	Less than 60 f/	City of Lindsay	40-65dB(A) i/

a/ Alternative Customer Group 1.
b/ Alternative Customer Group 2.
c/ Based on modeling of existing noise levels at the Topock Compressor Station property line.
d/ Based on extrapolation of community noise equivalent level (CNEL) contours from the Noise Element of the San Bernadino County General Plan.
e/ Based on typical average day-night sound levels for various population densities (National Academy of Sciences, 1977, as cited in WCC, 1994).
f/ Based on CNEL contours from the Noise Element of the Tulare County General Plan.
g/ No local noise ordinances are currently in effect; defer to the Federal standard.
h/ 55dB(A) for the time period 7:00 a.m. to 10:00 p.m., 45dB(A) for the time period 10:00 p.m. to 7:00 a.m.
i/ Depending on the octave band.

the Leq (24) with a 10-decibel penalty from 10:00 p.m. to 7:00 a.m. to account for the increased noise sensitivity of human hearing while asleep.

Various Federal and local agencies have guidelines for acceptable community noise levels. The Federal guideline for acceptable community noise levels is an Ldn of 55 dB(A), which is the level below which no interference with the intelligibility of human speech is expected (EPA, 1978). Table 4.10.2-1 includes the local guidelines for acceptable noise levels for the communities near the proposed compressor stations. The stations would be in rural or agricultural areas except for the Lindsay Compressor Station, which would be 150 feet south of the Lindsay city limits, but the surrounding land uses are predominantly agricultural and service commercial. The noise-sensitive areas (NSAs) near the proposed compressor stations are:

- **Topock Compressor Station** — The nearest NSAs are about 1 mile southwest and include houses and mobile homes. Other major noise sources in the area are U.S. Highway 66 to the south and the AT&SF railroad to the northwest.

- **Amboy Compressor Station** — The nearest NSAs, a group of three mobile homes, are about 2,600 feet southwest. Nine other NSAs are 0.5 to 1 mile away and include houses and mobile homes.

- **Daggett Compressor Station** — The nearest NSAs, a cluster of houses and mobile homes, are about 2,600 feet northwest. Several other houses and mobile homes are 0.5 to 1 mile away. Other major noise sources in the vicinity are Interstate 40/U.S. Highway 66 to the south and the AT&SF railroad and an electric power plant to the north.

- **Famoso Compressor Station** — The nearest NSA, a ranch house, is about 3,300 feet west. One house and one mobile home are 0.5 to 1 mile away. The Bakersfield Raceway to the southeast is the only other major noise source in the vicinity.

- **Lindsay Compressor Station** — The nearest NSA, a single family residence is about 500 feet west. Two apartment complexes, two mobile home parks, and 13 houses are within 0.5 mile. More than half of the City of Lindsay is within 1 mile. One other major noise source is in the vicinity, the AT&SF railroad to the east.

5.0 ENVIRONMENTAL CONSEQUENCES

The environmental consequences of constructing and operating the proposed Mojave Northward Expansion Project would vary in duration and significance. Four levels of impact duration were considered: temporary, short-term, long-term, and permanent. Temporary impact generally occurs during the construction phase, and the resources would recover during or immediately afterward. Short-term impact may last approximately 3 years following construction. Impact was considered long-term if the resource would require more than 3 years to recover. A permanent impact is a change in a resource involving an aboveground structure or area where the resource would not recover during the life of the project.

The specific criteria used to determine the significance of an impact are identified in each resource subsection. An impact was considered significant if any of the criteria would be met after Mojave implements all of the proposed mitigation measures and meets all agency requirements. We have recommended additional mitigation in an effort to reduce any significant impact to a less-than-significant level and to reduce impact levels overall. These measures appear offset in boldface in the text. The staffs of the FERC and SLC will recommend to their respective Commissions that their additional mitigation measures be included as specific conditions to any approving Certificate or permit issued for Mojave's project. The staffs will also recommend that Mojave be required to implement the mitigation measures Mojave has proposed as part of the project unless specifically modified by other Certificate conditions.

The assumptions of the analysis were:

- Mojave would comply with all applicable laws and regulations.
- Mojave would construct the pipeline and compressor stations as described in section 2 and implement the mitigation measures described in its application to the FERC and as discussed in this EIR/EIS.

General construction and operational impact and Mojave's proposed mitigation are discussed for each resource. Site-specific impact is discussed by exception, i.e., where it differs in a particular area from the general description of impact. Impact that remains significant despite mitigation is identified. All of the mitigation measures proposed as part of the project are listed in section 7.

5.1 GEOLOGY

5.1.1 Criteria for Evaluating Impact and Determining Significance

Adverse impact on geologic, mineral, or paleontological resources is considered significant and would require additional mitigation if:

- Geologic hazards could cause a rupture or failure of the pipeline or cause damage to related facilities that would present a significant threat to public safety.
- Construction activities or the siting of facilities would worsen existing unfavorable geologic conditions.

- Project construction or operation would preclude or disrupt the development of mineral resources.

- Project construction would result in the loss of vertebrate or invertebrate fossils that are considered to have scientific importance by paleontologists and land management agency staff.

5.1.2 General Impact and Mitigation

This section identifies the potentially significant impact that geologic resources may have on the proposed project and the potentially significant impact that construction may have on existing geologic resources. Areas of potentially significant impact along the proposed route are listed in table 5.1.2-1 at the end of section 5.1. Site-specific impact is discussed in section 5.1.3. Mojave plans to perform detailed, site-specific, geologic hazard investigations during the detailed engineering design phase of the project. The results of these investigations would be used to design mitigation, if needed, on a route-, fault-, or hazard-specific basis.

◆ **We recommend that Mojave file with the FERC and SLC prior to construction a Geologic Hazards Mitigation Plan for the review and written approval of the FERC's Director of the Office of Pipeline Regulation. Mojave's investigations must include, at a minimum, all sites listed in table 5.1.2-1.** [1]

5.1.2.1 Blasting

Ground vibrations from blasting could affect slopes, structures, wells, and paleontologic resource sites. Areas of potentially difficult excavation are listed in table 5.1.2-1 and are described in section 5.1.3.3. The procedures identified in section 2.4.1 would reduce the impact to insignificant levels.

5.1.2.2 Geological Hazards

Seismic faults, seismic ground shaking, soil liquefaction, subsidence, hydrocompaction, and landslides are the primary geologic hazards that could affect the proposed project and are listed by milepost in table 5.1.2-1.

Seismic Faults

Surface fault displacement could rupture an unprotected pipeline. As described in section 4.1.3, the proposed route crosses numerous faults. The significance of the potential impact of a fault on the pipeline would depend on the fault activity, the expected magnitude of displacement, and the geometry of the fault crossing. In general, a fault that has exhibited displacement in the last 700,000 years (Holocene or late-Quaternary) is considered active enough to require mitigation. Detailed geologic hazard investigations would be completed for all late-Quaternary faults. Specific mitigation measures, if needed, would then be designed on a fault-, route-, or site-specific basis.

---

[1] The FERC and SLC staffs will recommend to their respective Commissions that their additional mitigation measures (offset type in the text) be included as specific conditions to any approving Certificate issued for Mojave's project. The staffs will also recommend that Mojave be required to implement the mitigation measures that Mojave has proposed as part of the project unless specifically modified by other Certificate conditions.

The design of natural gas pipeline fault crossings is fairly routine. Where the pipeline must cross a historically active fault, it would be constructed so that, during an earthquake that causes ground surface rupture, the damage to the pipeline would be minimized, repairs could be made easily, and downtime would be limited. Mitigation design would be based on fault geometry, fault zone width, the type, amount, and direction of potential displacement, the recurrence interval for a certain-magnitude event along the fault, the local soil conditions, and the type and proximity of development.

Mojave's proposed mitigation design for fault crossings would include some or all of the following standard industry mitigation measures:

- Rerouting the pipeline to cross faults at as close to a right angle as possible to minimize the compressional forces and amount of shearing the pipeline would experience during an earthquake.
- Placing the pipe in a wide V-shaped trench as shallow as possible within the minimum required depth of cover and using loose, light-weight, granular backfill to allow the trench-pipe system to accommodate displacement on the fault or force the pipe to the ground surface without rupture during large-scale fault movement.
- Placing the pipe inside a larger pipe where bored crossings are indicated to isolate the pipeline from the fault displacement.
- Increasing the pipe wall thickness to withstand greater stress.
- Placing the pipe in structural supports that keep the pipe in place while the supports are displaced laterally during any surface fault rupture.
- Installing automatic shut-off valves on both sides of active fault crossings.

In populated areas, even if the pipeline at a major active fault crossing is designed to the best available engineering standards, the possibility of pipeline rupture as a result of fault displacement during an earthquake cannot be completely eliminated, and the impact would remain significant after mitigation. See sections 2.6 and 5.12 for discussions of pipeline safety and Mojave's emergency response plans.

Seismic Ground Shaking

Seismic ground shaking is a significant potential hazard to the proposed pipeline project. Damage to buried pipelines is most often caused by the differential movements of geologic materials as opposed to the actual shaking itself. Aboveground structures would more likely be damaged by groundshaking. Potentially hazardous ground failures caused by ground shaking include landslides, liquefaction, lateral spreading, settlement, and differential motions at soil-rock boundaries.

Mojave's proposed mitigation measures that would be implemented in areas of significant seismic ground shaking would include the following standard industry measures:

- Complying with pipeline design and construction codes and specifications.

- Designing aboveground structures to withstand the predicted level of ground shaking as well as site-specific soil conditions.

These measures would reduce the impact to less than significant.

Soil Liquefaction

Severe ground vibrations in cohesionless saturated sand and silt deposits can cause temporary increases in pore water pressure, which can cause soils to lose strength. For liquefaction to occur, a relatively shallow water table, rapid strong ground motions, and susceptible soils must all be present. Liquefaction can affect a pipeline by causing lateral spreading, loss of bearing strength, flow failures, subsidence, and flotation. Given the ductility of modern pipelines, little impact is likely to result from flotation.

Lateral spreading, which involves the horizontal movement of competent surficial soils due to the liquefaction of an underlying deposit, is a greater potential hazard to pipeline integrity. Lateral spreading is most likely to occur at drainage crossings with young, susceptible materials, shallow water tables, and sloping terrain. Flow failures can bend and weaken a pipeline along slopes, and subsidence and the loss of bearing can cause a pipeline to lose support and be at risk from overburden pressure.

Mojave's proposed mitigation design for potential pipeline failure due to liquefaction or lateral spreading would include some or all of the following standard mitigation measures:

- In-place compaction.
- Gravel replacement of liquefiable soils.
- Stone column supports.
- Grouting.
- Supporting the pipe on deep foundations.
- Placing the pipe below liquefiable materials.
- Routing the pipeline around liquefiable areas.
- Installing automatic shutoff valves beyond the limits of potential lateral spreading.

The specific mitigation measures required in a particular area would be determined following Mojave's proposed site-specific geologic hazard investigations, which would include cone penetration tests of areas of greatest potential for liquefaction. The mitigation measures listed above would reduce the impact to less than significant.

Subsidence and Hydrocompaction

Subsidence can occur because of subsurface mining, oil or groundwater withdrawal, decomposition of buried organic material, or tectonic activity. Hydrocompaction is a type of subsidence that can occur when the moisture content increases in collapsible soils that have never been wetted. This can decrease soil volume and lead to slumping, cracking, and collapsing. Subsidence often occurs over a very large area and long time period, and differential settlements are small. The margins of subsiding areas can, however, be abrupt. In such areas, differential settlement can be greater, and sheer walls can develop that are capable of rupturing a pipeline.

Mojave's proposed mitigation design for potential pipeline failure due to collapsible soils would include some or all of the following standard mitigation measures:

- Removing collapsible soils.
- Constructing deep foundations to bypass collapsible soils.
- Precollapsing soils prone to hydrocompaction by wetting.

The specific mitigation measures required in a particular area would be determined following Mojave's proposed site-specific geologic hazard investigations. Implementation of these measures, as appropriate, would reduce the impact to less than significant.

Landslides

Potential slope failure hazards occur in a number of areas along the proposed pipeline route, especially in the Coast Ranges where numerous ancient and recent landslides and debris flows are present in the sloping terrain. The best mitigation for landslide hazards is to avoid landslide-prone areas. Mojave has routed the pipeline to avoid some areas of extensive landsliding, but, given the widespread occurrence of landslides in some areas of the Coast Ranges and the reconnaissance-level nature of Mojave's data, the proposed pipeline route still crosses many areas prone to landsliding. Mojave's proposed geologic hazard investigations would further evaluate landslide hazards in the Coast Ranges and other areas with sloping terrain.

Mojave's proposed mitigation design for potential pipeline failure due to landslides or potential slope instability would include some or all of the following standard mitigation measures:

- Rerouting where feasible to avoid major slide areas.
- Burying the pipe deeper than the slide zone.
- Stabilizing landslides by remedial grading or other methods if economically feasible.
- Designing the pipeline crossing to minimize damage in the event of mass movement.
- Using automatic shutoff valves in landslide prone areas.

The specific mitigation measures required in a particular area would be determined following Mojave's proposed site-specific geologic hazard investigations.

The potential for landslides is an unfavorable geologic condition and where the pipeline would cross landslide-prone terrain, it may not be possible to completely mitigate the potential for pipeline construction to increase the slope instability. The proposed mitigation would reduce but not eliminate the possibility that pipeline construction and operation could worsen this condition, and the impact would remain significant after mitigation.

Soft Clays (Bay Muds)

Soft clay materials consisting of San Francisco Bay Muds that are susceptible to settlement are anticipated to be encountered near Suisun Bay in Antioch and Martinez and near San Francisco Bay in San Mateo and South San Francisco. In some cases, fill may overlie the Bay Muds. Where Bay Muds would immediately underlie the pipeline trench, they could be disturbed and weakened during construction, causing long-term settlement of the pipeline. Similarly, placing new fill over Bay Mud could also cause long-term settlement. Mojave's proposed geologic hazard investigations would include site-specific evaluations of the potential for pipeline settlement in areas underlain by Bay Muds.

Mojave's proposed mitigation design for potential pipeline failure due to settlement in areas underlain by Bay Muds would include some or all of the following standard mitigation measures:

- Designing a flexible pipeline.
- Excavating and replacing Bay Muds with granular material.
- Placing the pipeline on piles.
- Rerouting the pipeline.

The specific mitigation measures required in a particular area would be determined following Mojave's proposed site-specific geologic hazard investigations. These measures would reduce the impact to less than significant.

5.1.2.3 Mineral Resources

No significant adverse impact on the current development or future extraction of mineral resources is anticipated. The potential impact on mineral resources would be minor because the resources involved are generally sand and gravel and because the route through these areas is within or adjacent to existing rights-of-way for roads, railways, and a pipeline. The rights-of-way preclude shallow mining and currently serve as barriers to mineral extraction. Because sand, gravel, and rock resources are generally broadly distributed, the loss of any potential resources could be offset by obtaining similar resources nearby.

Existing oil and gas resources would not be affected by the proposed project because these resources are extracted from zones several hundred feet below the surface. Mojave has obtained maps from the California Department of Conservation, Division of Oil and Gas, and identified only one completed oil well in Tulare County, one idle oil well in Kern County, and 28 plugged or abandoned oil or natural gas wells that could be in or adjacent to the proposed pipeline right-of-way. To mitigate the hazard potential that could result from pipeline construction near these wells, Mojave would:

- Coordinate with the field operations managers of these wells to ensure that pipeline construction would not result in a hazard.
- Maintain adequate clearances and access for well workover equipment during construction.

5.1.3 Site-Specific Impact and Mitigation

Areas where geologic hazards would be significant were listed according to physiographic province in table 5.1.2-1. The significant impact in each geologic province is described below. For each site-specific impact, the mitigation would be that described in section 5.1.2. The final mitigation design would be based on the site-specific geologic hazards investigation and included in Mojave's Geologic Hazards Mitigation Plan. Unless otherwise stated, the mitigation would reduce the impact to less than significant levels.

5.1.3.1 Mojave Desert

No significant geologic hazards have been identified along Loops 1 and 2 or at the two compressor stations that would be constructed in the Mojave Desert. A volcanic hazard has been identified near the proposed Amboy Compressor Station; however, volcanic eruptions are considered rare, and no mitigation is recommended.

Loop 3 would cross a zone of potential liquefaction adjacent to the Mojave River and the South Lockhart Fault, which has been active since the late Quaternary. Mitigation would be required for the South Lockhart Fault.

5.1.3.2 Central Valley

Loop 4 would cross four faults considered potentially significant hazards: the White Wolf Fault, the Edison Fault, and Unnamed Faults EL-2 and EL-3 (see table 5.1.2-1). No other significant geologic impact has been identified along Loop 4. The North Mainline would cross two faults that may require mitigation: the New Hope Fault and the Premier Fault (see table 5.1.2-1). There is evidence that the New Hope Fault has been active during the last 2 million years and the Premier Fault has been active in the last 200 years. Mojave has stated that it would reroute Loop 4 to avoid crossing Unnamed Fault EL-2 but has not yet proposed a route alternative.

Although the North Mainline would cross areas that may be prone to regional subsidence, liquefaction, and settlement in southern San Joaquin Valley and on the west side of the valley near Coalinga, no specific mitigation measures other than standard construction practices are considered necessary. Mitigation other than standard construction practices would not be necessary because the subsidence occurs over a large area and resulting stresses that may be imposed on the pipeline would be too small to significantly impact the pipe.

The Coalinga and Tracy Segments would cross areas prone to significant ground shaking due to earthquakes (see table 5.1.2-1).

At stream and river crossings within the Central Valley, the pipeline would extend through geologic materials capable of liquefaction. Ground shaking within the valley, however, is not anticipated to be great enough to warrant mitigation for liquefaction potential within the Central Valley.

The Sacramento Mainline would not cross any area with an identified geological hazard.

5.1.3.3 Coast Ranges - San Francisco Bay Area

North Mainline

The significant fault crossings on the North Mainline would be the Midway Fault, the Coral Hollow Fault, the Greenville Fault Zone, and the Antioch-Davis Fault (see table 5.1.2). The Midway and Coral Hollow Faults have been active in the last 100,000 years. Mojave has proposed detailed, site-specific geologic hazard investigations to determine whether mitigation would be required. The Greenville Fault Zone has had displacement as recently as 1980, and mitigation for potential fault rupture would be required. The Antioch-Davis Fault has been mapped within 1,000 feet of the proposed route, but mitigation for potential fault rupture would only be necessary if the fault is crossed.

The North Mainline would cross numerous areas where landslides have been known to occur or where unstable geologic materials and steep slopes coincide, creating a landslide potential (see table 5.1.2-1).

Along the proposed route of the North Mainline, areas of potential liquefaction consisting of saturated, loose, alluvial sediments or intertidal deposits occur near Suisun Bay, Pacheco Creek, and the San Joaquin River between Martinez and Antioch. Mojave would evaluate in detail the potential for liquefaction in each of these areas (see table 5.1.2-1). The evaluations would include borings and core penetration tests in potentially liquefiable areas and an assessment of the potential earthquake design ground motions.

Areas of potentially difficult excavation would occur along the North Mainline where the route crosses hard cemented sandstone or conglomerate of the Panoche Formation in the Diablo Range. Mojave would perform geophysical studies in these areas to determine the need for blasting. The potential impact of blasting was described in section 2.4.1.

Unique geologic features consisting of tors, tafoni, and tanaja also occur within sandstone and conglomerate portions of the Panoche Formation. These features are especially prevalent in the Brushy Peak/Vasco Caves area near MP 252/261 of the North Mainline. They support sensitive aquatic and terrestrial habitats as well as archeological resources. The proposed route avoids known locations of these features, and, because construction workers would be restricted to the right-of-way at all times in sensitive locations, no impact would occur.

Palo Alto Segment

The Palo Alto Segment would cross areas prone to fault rupture, earthquake shaking, landslides, liquefaction, settlement, and difficult excavation. These areas of potential impact were listed in table 5.1.2-1. The segment would cross four faults that would require mitigation: the Los Positas Fault, the Verona Fault, the Calaveras Fault Zone, and the Hayward Fault Zone. The Hayward Fault Zone would be crossed in a populated area. Although mitigation would reduce the likelihood of a rupture due to fault displacement during an earthquake, a rupture would still be possible and could pose a significant threat to public safety in populated areas. A significant impact would, therefore, remain after mitigation. Mojave has stated that it would reroute the segment to avoid the Los Positas Fault crossing but has not yet proposed a route variation.

The Palo Alto Segment would cross areas prone to landslides between MP 11 and MP 26. Table 5.1.2-1 lists the specific areas where potentially weak rock and steep slopes coincide.

The Palo Alto Segment would cross two areas of recent alluvium that are prone to settlement or liquefaction (see table 5.1.2-1). Liquefaction could also occur along San Francisco Bay in San Mateo and South San Francisco.

Fremont Segment

The Fremont Segment would cross the Hayward Fault Zone in a populated area (see table 5.1.2-1). This segment would also cross intertidal deposits that could be prone to liquefaction between MP 0 and MP 15.6.

Oakland Segment

The Oakland Segment would cross four faults that have been active in historic times: the Calaveras Fault Zone, the East Chabot Fault, the West Chabot Fault, and the Hayward Fault Zone (see table 5.1.2-1). Mitigation for the Calaveras and Hayward Fault Zones would be needed. The segment would cross concealed traces of the East and West Chabot Faults where rupture may not be a hazard, but the geologic hazard investigations would need to verify this.

The Oakland Segment would also cross landslides and landslide-prone areas between MP 16 and MP 18 (see table 5.1.2-1).

Antioch Segment

An area of potential landsliding would be encountered along the first mile of the Antioch Segment where sedimentary rocks and steep slopes coincide (see table 5.1.2-1).

The Antioch Segment would be within 1,000 feet of the Antioch Fault, which has displayed Holocene creep, but specific mitigation would not be required because the pipeline would not cross this fault.

5.1.4 Impact on Paleontologic Resources

Paleontologic resources could be affected by pipeline or compressor station construction as well as by the resulting increased public access to these resources. Our evaluation of the potential impact of the proposed pipeline project on paleontologic resources was based on a preliminary review of published scientific literature and information available at institutions serving as repositories for paleontologic resources including the University of California Museum of Paleontology, the San Bernardino County Museum, and the Natural History Museum of Los Angeles County. A comprehensive review of paleontologic site records has not been completed. The precise locations of specific paleontologic resources along the proposed route are uncertain although our preliminary estimate is that six recorded sites may be near or within the proposed pipeline right-of-way.

Direct physical modifications of paleontologic resources could occur during project construction by ground-disturbing activities such as trenching. Indirect impact on fossil beds could result from erosion caused by slope regrading and vegetation clearing. Additional indirect effects could result from the unauthorized collection of fossils because of increased access to previously undisturbed areas created by cleared pipeline rights-of-way. Avoidance of significant fossil localities is the most effective mitigation method. If avoidance is not possible, scientific excavation to recover the fossil materials would reduce the impact to an acceptable level.

- **We recommend that, before beginning any ground-disturbing activities, Mojave conduct a field survey of the construction right-of-way in all areas underlain by a geologic formation identified in table 4.1.4-1 as having high paleontological sensitivity.**

Areas of moderate, low, or no paleontologic sensitivity would not require preconstruction field surveying because a surface survey would not likely change the sensitivity classification; the few existing sites that might be encountered in these areas would not likely be discovered by a field survey.

To reduce construction-related impact on paleontologic resources to less than significant levels:

- **We recommend that a paleontologic monitor be present during all excavation activities in these areas of high sensitivity. Mojave should also monitor excavation activities on a part-time or spot-check basis in areas classified as having moderate sensitivity. We further recommend that Mojave develop a Paleontologic Resource Management Plan (PRMP) in consultation with the appropriate Federal and state agencies. The PRMP should include:**

  - **Mitigation measures that would be implemented for each fossil site identified during the preconstruction field survey or discovered during construction including their controlled scientific removal.**

  - **Provisions for the preparation and curation of any fossil collections.**

  - **Protocol for the preparation of a final report based on the data recovered.**

  All work should be performed by qualified paleontologists. The PRMP should be submitted to the appropriate Federal and state agencies and filed with the FERC and SLC for the review and written approval of the FERC's Director of the Office of Pipeline Regulation prior to construction.

TABLE 5.1.2-1

Areas of Potential Significant Geologic Impact

Pipeline/Segment	Mileposts	Geologic Condition or Feature	Comment
Mojave Desert			
Loop 3	All	Earthquake shaking	Expected peak bedrock acceleration = 0.5 - 0.6
	15.5 - 17.5	South Lockhart Fault	Late Quaternary; four crossings; maximum estimated displacement = 3.6 feet
Daggett Compressor Station	–	Earthquake shaking	Expected peak bedrock acceleration = 0.5
Central Valley			
Loop 4	0.1	White Wolf Fault	Holocene (<10,000 years) displacement
	10.0	Edison Fault	Quaternary (<2 million years) displacement
	14.5 - 16.5	Unnamed Fault EL-2	Quaternary-Holocene displacement
	20.6	Unnamed Fault EL-3	Displaces Middle to Late Quaternary deposits
	All	Earthquake shaking	Expected peak bedrock acceleration = 0.5 - 0.6
North Mainline	2.5 - 8.0	New Hope Fault	Quaternary (<2 million years) displacement; alignment crosses and parallels multiple short strands
	16.4	Premier Fault	Historic (<200 yrs) displacement; alignment crosses projection of fault
Coalinga Segment	40.3 - 52.5	Earthquake shaking	Expected peak bedrock acceleration = 0.4 - 0.6
Tracy Segment	All	Earthquake shaking	Expected peak bedrock acceleration = 0.4 - 0.5
Coast Ranges - San Francisco Bay Area a/			
North Mainline	235.7/244.4-291/299.9	Earthquake shaking	Expected peak bedrock acceleration = 0.4 - 0.6
	235.7/244.4-243.0/251.6	Landslide potential and potentially difficult excavation	Cretaceous-Tertiary sedimentary rocks where slopes are >15%, especially the Panoche Formation.
	238.4/247.0	Midway Fault	Late Quaternary (<100,000 yrs) displacement
	245.0/253.7	Coral Hollow Fault	Late Quaternary (<100,000 yrs) displacement; querried fault projection

TABLE 5.1.2-1 (cont'd)

Pipeline/Segment	Mileposts	Geologic Condition or Feature	Comment
North Mainline (cont'd)	245.5/254.1-250.5/259.1	Greenville Fault Zone	Historic displacement; 1980 rupture, multiple fault strands; APSS zone; two crossings
	250.4/259.0-264.0/272.9	Landslide potential; potentially difficult excavation	Cretaceous-Tertiary sedimentary rocks where slopes are >15%, especially the Panoche Formation
	262.8/271.6-262.9/271.7	Antioch/Davis Fault	Late Quaternary (<100,000 yrs) displacement; fault mapped within 1,000 feet of alignment
	263.9/272.6-277.1/285.9	Landslide potential; potentially difficult excavation	Cretaceous-Tertiary sedimentary rocks where slopes are >15%, especially the Panoche Formation
	277.1/285.9-285.2/294.1	Settlement and liquefaction potential	Alluvium
	285.2/294.1-288.9/297.9	Settlement and liquefaction potential	Intertidal deposits and Bay Mud
Palo Alto Segment	0.9 - 1.8 1.9 - 2.6	Las Positas Fault	Historic displacement; multiple fault strands
	5.0	Landslide	Alignment extends through slide
	8.6 - 9.5	Verona Fault	Historic displacement; maximum estimated displacement = 0.8 foot
	12.0 - 14.0	Settlement and liquefaction potential	Alluvium
	12.7 - 12.9	Calaveras Fault Zone	Historic displacement; multiple fault strands; possible APSS zone; maximum estimated displacement = 8.1 feet
	14.7 - 22.5	Landslide potential	Cretaceous-Tertiary sedimentary rocks where slopes are >15%
	22.2 - 22.5	Hayward Fault Zone	Historic displacement; multiple fault strands; APSS zone; maximum estimated displacement = 11.9 feet
	24.8 - 45.0	Settlement and liquefaction potential	Alluvium
	All	Earthquake shaking	Expected peak bedrock acceleration = 0.4 - 0.6
Fremont Segment	14.3 - 14.6	Hayward Fault Zone	Historic displacement; multiple fault strands; APSS zone
	All	Earthquake shaking	Expected peak bedrock acceleration = 0.4 - 0.6

TABLE 5.1.2-1 (cont'd)

Pipeline/Segment	Mileposts	Geologic Condition or Feature	Comment
Oakland Segment	11.4 - 11.6	Calaveras Fault	Historic displacement; alignment crosses and parallels multiple strands; APSS zone; maximum estimated displacement = 8.1 feet
	16.9 - 17.6	Landslide potential	Cretaceous-Tertiary sedimentary rocks where slopes are >15%
	25.0 - 31.7	Settlement and liquefaction potential	Alluvium
	22.3 - 22.7	Hayward Fault	Historic displacement; APSS zone; maximum estimated displacement = 11.9 ft
	24.9 - 25.1	East Chabot Fault	Alignment crossed concealed fault; APSS zone
	25.6 - 25.8	West Chabot Fault	Alignment crosses concealed fault; APSS zone
	All	Earthquake shaking	Expected peak bedrock acceleration = 0.4 - 0.6

---

a/ No significant hazards noted along Hunters Point and San Francisco Segments.

5.2 SOILS

5.2.1 Criteria for Evaluating Impact and Determining Significance

Adverse effects on soils are considered significant and would require additional mitigation if project construction or operation would:

- Increase erosion rates or reduce soil productivity by compaction or soil mixing to a level that would prevent successful rehabilitation and eventual reestablishment of vegetative cover to the recommended or preconstruction composition and density.
- Reduce agricultural productivity for longer than 3 years because of soil mixing, structural damage, or compaction.

5.2.2 General Impact and Mitigation

The proposed project could adversely affect soils in several ways: increasing soil erosion, decreasing soil productivity, increasing soil compaction, increasing weeds, and disrupting agriculture. The potential for increased soil erosion and destabilization could result from construction activities such as clearing, trenching, grading, and backfilling. Susceptibility to erosion by wind or water depends on such factors as soil texture and structure, topography, amount of vegetative cover, and climate. Wind-induced erosion often occurs on dry, sandy soils where the vegetative cover is sparse and difficult to maintain as in the Mojave Desert and parts of the Central Valley. Water-induced erosion occurs mainly on loose soils on moderate to steep slopes. Increased rates of erosion and loss of topsoil would result from exposure to the forces of wind and water during construction. Increased erosion near streams could lead to siltation, which could significantly affect water quality and aquatic habitats (see section 5.3.3). The magnitude, extent, and duration of this effect would depend on proximity to water, the type of soils, the construction method and duration, and the time of year.

The loss of topsoil could also prevent the successful rehabilitation of the affected areas within the right-of-way because the permanent stabilization and restoration of soils are achieved to a large extent by reestablishing a vegetative cover. Soil productivity is affected by erosion, compaction, and the mixing of topsoils and subsoils during grading and trenching, which dilutes the chemical and physical properties of the topsoil with those of the less productive subsoil. Soil compaction is caused by heavy equipment and motor vehicles. The degree of compaction depends on the moisture content and texture of the soil. Compaction damages soil structure and reduces pore space, impeding the movement of water and air to plant roots and resulting in slower growth. Construction activities can reduce agricultural productivity by disrupting or damaging irrigation and drainage systems, and large stones brought to the surface during trenching can interfere with agricultural machinery. Shallow trenching can interfere with the future placement of drainage tiles.

Construction can facilitate the establishment of noxious weeds where none or few existed. The clearing of existing perennial vegetation can provide opportunities for weed species to invade. The seriousness of this effect would depend on the species, its prevalence in the area before construction, and the weed's effect on current or future land use.

In response to concerns regarding the potential environmental impact of pipeline projects in general, the FERC staff developed the Erosion Control, Revegetation, and Maintenance Plan (Plan) in appendix A, which outlines procedures to minimize erosion and sedimentation resulting from pipeline construction and operation. Mojave has agreed to incorporate the Plan into its general construction plans. The mitigation measures specified in the Plan are summarized below.

Supervision and inspection:

- Environmental inspectors would ensure compliance with the environmental conditions of Mojave's Certificate, authorization, and other permits and approvals.

Clearing and pipe installation:

- On annually cultivated or rotated agricultural lands, residential areas, and other areas at the landowner's or land management agency's request, the topsoil and subsoil removed from the trench would be segregated and stored as discrete rows within the right-of-way adjacent to the portion of the trench from which they were removed. Stones larger than 4 inches in diameter would be separated from the topsoil to prevent possible damage to farm equipment.
- Any drainage tiles damaged during construction would be repaired to their original or better condition in accordance with the landowner's specifications.
- Water flow in crop irrigation systems would be maintained unless shutoff has been coordinated with affected parties.
- Temporary slope breakers would be used to direct water runoff away from the construction right-of-way into energy-dissipating devices.
- Temporary sediment barriers would be placed at the bases of slopes adjacent to all road or waterbody crossings where vegetation has been disturbed to prevent sediment migration offsite. These barriers would remain in place until permanent revegetation measures are judged successful.
- Trench breakers would be used on all slopes adjacent to water bodies and wetlands and in agricultural fields and residential areas if needed. Trench breakers are typically sacks of sand or soil that are placed in a trench around the pipe to prevent subsurface channeling of water along the trench.

Cleanup and restoration:

- If final cleanup and installation of permanent erosion control measures cannot be completed within 10 days of backfilling the trench, all required temporary erosion control structures would be installed and maintained.
- If requested by landowners or land management agencies, large rocks and slash would be spread over the right-of-way during cleanup to reduce erosion, provide microsites for seedling growth, and discourage off-road vehicle traffic.

- Permanent slope breakers would be constructed and maintained in all areas except cultivated lands and lawns following the recommendations of the local soil conservation authorities.

- In most areas, rutted or compacted soils would be loosened and restored by ripping or chiseling. For any severely compacted soils in agricultural areas, a "green manure" crop such as alfalfa would be plowed in to decrease soil bulk density and improve productivity.

- All turf, ornamental shrubs, and other landscaping would be restored to the landowners' specifications, or the landowners would be compensated in an amount sufficient for replacement.

Revegetation:

- In disturbed areas, Mojave would prepare seed beds following the recommendations of local soil conservation authorities as to the need for fertilizer and pH-modifying agents.

- Mojave would mulch all dry sandy sites and slopes steeper than 8 percent with 2 tons of straw, hay, or its equivalent per acre unless the local soil conservation authority recommends otherwise in writing. The mulch would be anchored immediately using a mulch-anchoring tool or liquid mulch binder. Jute thatching or bonded fiber blankets would be used on streambanks instead of straw or hay.

- Mojave would conduct followup inspections and take corrective actions until revegetation is successful.

Mojave submitted a project specific revegetation plan that we have reviewed and amended where necessary to meet the requirements of the resource agencies. These Project Revegetation Requirements are contained in appendix B and discussed in section 5.4.

Many areas of the right-of-way would be susceptible to high wind erosion, which would create fugitive dust emissions that are regulated by air pollution control districts. Mitigation measures for wind erosion are discussed in section 5.11.1. We believe implementation of these mitigation measures would reduce the impact of the construction and operation of the proposed project to less than significant levels.

5.2.3 Site-Specific Impact and Mitigation

In addition to implementing the FERC staff's Plan (appendix A) summarized above, Mojave would perform more detailed geotechnical studies to identify collapsible soils. Mojave would develop

---

1/ **The FERC and SLC staffs will recommend to their respective Commissions that their additional mitigation measures (offset type in the text) be included as specific conditions to any approving Certificate issued for Mojave's project. The staffs will also recommend that Mojave be required to implement the mitigation measures that Mojave has proposed as part of the project unless specifically modified by other Certificate conditions.**

site-specific plans to address potential sensitive areas such as areas with high erosion susceptibility or steep slopes, agricultural areas with drainage tiles, areas of wet soils, and areas of low fertility. On private land, any deviations that would constitute less protective measures than those in the Plan would be permitted only with the written approval of the Director of the Office of Pipeline Regulation. Any site-specific measures stipulated on Federal land by the appropriate Federal land management agency would take precedence over the measures described in the Plan.

Steep Slopes

The proposed right-of-way crosses numerous areas of steep side-sloping terrain where cut-and-fill construction would be necessary to create a level working surface for equipment. Steeps slopes are found in all three physiographic provinces but occur most prevalently in the Coast Ranges-San Francisco Bay Area. Shallow soils, unstable soils, and soils with high to severe erosion potential are commonly found on steep slope and would require mitigation suited to this type of terrain. The steepness of the natural slope and the characteristics of the soil would determine the slope, size, and depth of the cut-and-fill needed for construction. Cut-and-fill construction methods generally require extra workspace to store the additional spoils that would be excavated.

Drainage Tiles

Drainage tiles and subsurface drainage systems could be damaged by operating heavy equipment or by trenching operations in agricultural areas of the Central Valley. If not repaired, the soil might not drain properly, and agricultural productivity could be reduced. To prevent or minimize the extent and duration of damage to subsurface drainage systems, Mojave would identify tiles prior to construction by contacting landowners and local SCS personnel. The areas along the proposed right-of-way where drainage tiles are most likely to be encountered are the agricultural areas of the San Joaquin and Sacramento Valleys. Although the North Mainline would generally follow previously disturbed land such as the Highway 99 and SP railroad rights-of-way, the various other segments would often cross open agricultural land.

All drainage tiles damaged during construction would be repaired to their original or better condition. Any drainage tiles cut during construction would be temporarily repaired to allow free flow during construction. Mojave would make permanent repairs immediately after the pipe has been lowered into the trench in accordance with the specifications of the landowner, SCS, or land management agency and with consideration to capacity, depth, spacing, velocity, grade, materials, filters, placement methods, bedding, and backfill.

Hydric Soils

Common soil-related problems are slumping, compaction, and rutting in wet or saturated soils. These problems are caused by seasonal precipitation and high water tables and can result in low weight-bearing capacities and resistance to disturbance. Wet soils and soils with high clay contents are the most susceptible to compaction, ponding, and structural damage from the movement of heavy equipment. These problems are most acute during excessively wet periods and in areas that are seasonally flooded or poorly drained.

Wet soils and wet conditions would be encountered mainly in the Coast Ranges - San Francisco Bay Area and the Central Valley; however, some soils in the Mojave Desert might be subject to high water tables following winter storms. Where the proposed right-of-way crosses hydric soils, mitigation measures would be implemented as specified in the Wetland and Waterbody Construction and Mitigation Procedures (appendix C).

◆ **We recommend that Mojave halt construction on a site-specific basis in agricultural areas when rainfall or flooding results in saturated soils, which are vulnerable to slumping, compaction, and rutting. In the event that construction activities are stopped by Federal land management agencies to prevent excessive tracking and rutting, we recommend that similar activities also be halted on nearby non-Federal lands.**

Low-Fertility Soils

Loss of soil productivity impairs revegetation and is detrimental to the success of restoration efforts. Factors contributing to loss of ability to support vegetation include erosion, compaction, and the mixing of topsoils and subsoils during grading and trenching. This mixing reduces productivity by diluting the superior chemical and physical properties of the topsoil with those of the less productive subsoil. Mojave would segregate and replace removed topsoil from subsoil as described in section 2.4.1 and implement the Plan (appendix A) so that any effects would be reduced to less than significant.

Asbestos-Containing Soils

The Coalinga Segment would cross the alluvial fan of Los Gatos Creek, which drains east from the Diablo Range, between MP 37.5 and MP 39.3. The California Aqueduct crosses the alluvial fan and impounds seasonal runoff against its western levee, which causes ponding and deposition of the transported sediment load. The load can be quite large after a heavy winter storm, and the deposited silts contain unknown quantities of naturally occurring asbestos that has eroded from the Diablo Range (Arroues and Schmidt, 1994, personal communication). The Diablo Range west of Coalinga contains two former asbestos mine sites, which have been designated as National Priority List (Superfund) sites. Trenching through this area may disturb asbestos and cause it to become airborne and hazardous.

5.2.4 Impact and Mitigation of Aboveground Facilities

Adverse effects on soils due to the construction and operation of the proposed compressor and meter stations would be similar to those caused by construction of the pipeline (see section 5.2.2).

The mitigation of these potential effects of constructing the aboveground facilities would be similar to the mitigation measures proposed for soils in the pipeline right-of-way, which were discussed in section 5.2.3. Operation of the aboveground facilities would not result in adverse effects on soils.

5.3 WATER RESOURCES

5.3.1 Criteria for Evaluating Impact and Determining Significance

Adverse impact on shallow groundwater supplies is considered significant and would require additional mitigation if project construction or operation would result in short- or long-term:

- Alteration or interruption of the flow of groundwater to wetland areas.
- Degradation of groundwater uses for private or municipal purposes.
- Interruption or substantial restriction of the natural hydraulic flow of water to local springs.

Adverse impact on streams or rivers is considered significant and would require additional mitigation if project construction or operation would:

- Alter channelbed armoring so it results in short- or long-term erosion.
- Cause the resuspension of contaminated bottom sediments that would degrade the quality of water downstream.
- Result in short- or long-term sedimentation affecting the operation of irrigation water control structures or the quality of municipal water supply reservoirs.
- Reduce stream flow quantity greater than 10 percent where it would significantly damage either downstream beneficial uses or aquatic life.

5.3.2 Groundwater

5.3.2.1 General Impact and Mitigation

The construction activities that could affect shallow groundwater are: clearing and grading; trench blasting; refueling of vehicles and storage of fuel, oil, and other fluids; trench dewatering of shallow groundwater; and withdrawals for hydrostatic testing. Most of the potential impact associated with these activities would be avoided or minimized by the use of both standard and specialized construction techniques.

Clearing and Grading

Shallow aquifers could experience minor impact from changes in overland water flow and recharge caused by clearing and grading of the proposed right-of-way. In surface-to-groundwater recharge areas, enhanced water infiltration provided by a well-vegetated cover would be temporarily lost until revegetation has occurred. Near-surface soil compaction caused by heavy construction vehicles could also reduce the soil's ability to absorb water. These effects would be temporary and would not significantly affect groundwater resources.

Blasting

Grade and trench blasting would be necessary where bedrock is exposed at the surface or less than 6 feet bgs. Blasting near groundwater wells may cause temporary changes in water level and turbidity (Froedge, 1980). There are no public supply wells within 0.25 mile of the pipeline right-of-way where blasting might be required; however, bedrock-supplied private or irrigation wells may be located along the proposed route near the construction right-of-way. Using proper blasting techniques, rock would be fractured only within the immediate blast area in the pipeline right-of-way (Siskind and Fuimanti, 1974). It is unlikely that groundwater quality and supply systems outside these areas would be affected. To mitigate the potential effects of blasting on wells, Mojave would provide a temporary source of water and repair, replace, or restore any affected well to its former capacity if the groundwater supply is adversely affected.

Fuel Maintenance

The refueling of vehicles and the storage of fuel, oil, and other equipment-related fluids during construction could create a potential long-term contamination hazard to shallow aquifers. This would be avoided or minimized by restricting the location of refueling and storage facilities and by requiring immediate cleanup in the event of a spill or leak.

Mojave proposes to reduce the potential impact of a spill on shallow groundwater to less than significant by:

- Following the Spill Prevention, Containment, and Control Plan (SPCC Plan) to prevent and clean up spills of fuels, lubricants, and other chemicals.
- Specifying collection and disposal procedures for wastes generated during vehicle maintenance.
- Requiring each construction crew to have sufficient supplies of absorbent and barrier materials on hand to rapidly recover any spills.
- Developing standard procedures for the excavation and offsite disposal of any soil or other materials contaminated by a spill.
- Prohibiting refueling and hazardous materials storage within 200 feet of all private wells and 400 feet of all municipal or community water supply wells.

♦ **We recommend that Mojave revise its SPCC Plan before commencing construction to identify the types and quantities of fuels, lubricants, and other hazardous materials that would be stored or used in the rights-of-way and stockpile areas and to identify the types of containers that would be used to store these materials. 1/**

1/ The FERC and SLC staffs will recommend to their respective Commissions that their additional mitigation measures (offset in boldface type in the text) be included as specific conditions to any approving Certificate issued for Mojave's project. The staffs will also recommend that Mojave be required to implement the mitigation measures that Mojave has proposed as part of the project unless specifically modified by other Certificate conditions.

Trench Dewatering

Dewatering of the pipeline trench would be the only activity requiring pumping of shallow groundwater. Dewatering may be necessary where the water table is high. The potential effect of groundwater withdrawal on users of the aquifer would depend on the rate and duration of pumping. Pipeline construction activities at a particular location are typically completed within several days. The methods for discharging water produced by trench dewatering are discussed in section 5.3.3. If these procedures are followed, dewatering during construction would generally have a temporary, minimal effect on shallow groundwater.

Water table elevations could also be affected by trenching and backfilling, potentially resulting in an adverse impact on springs and wetlands. These changes are generally temporary, and water table elevations are quickly reestablished; however, alteration of the natural soil strata could result in new migration pathways for groundwater. To prevent this, Mojave would use natural backfill to fill the trench and construct trench breakers (water diversion dams) along the trench where nonnative backfill is used.

Hydrostatic Testing

The sensitive aquifers or basins along the proposed route are those that are shallow, unconfined, and overlain by highly permeable alluvium as well as those that are used for drinking water or irrigation. Overdraft conditions could occur in any groundwater basin during withdrawals for hydrostatic testing, reducing the volume of groundwater available to existing users for irrigation, drinking water, etc. The pipeline would be tested in sections by filling a section with water and keeping it at the requisite operating pressure during the test. The test water would be reused as much as possible by transferring it to the next section to be tested. Test water would be withdrawn from either surface or groundwater sources. Where adequate surface or groundwater supplies are not available, Mojave could be required to truck water from approved sources in other areas. Test water withdrawn from streams or rivers would be regulated to maintain adequate downstream flow to protect aquatic life and existing downstream uses. A multibag filter would be used to remove solids before discharging test water. The rate of discharge of hydrostatic test water would be controlled to prevent erosion and downstream sedimentation.

5.3.2.2 Site-Specific Impact and Mitigation

Specific concerns regarding the potential impact of blasting on private groundwater wells were raised during the public scoping. Mojave has indicated that blasting would be conducted in such a way that groundwater wells would not be affected (see section 2.4.1). Mojave has nevertheless indicated that any impact on a supply well would be mitigated, and, if necessary, an adequate water supply would be provided to the affected party in the interim.

Where blasting would be required, baseline monitoring data would be required to determine whether pipeline construction was the cause of any adverse effect such as a change in a well's water quality or yield and to ensure the effectiveness of that mitigation.

- **We recommend that Mojave submit a Groundwater Monitoring Plan to the FERC and SLC for areas where blasting might be required before commencing construction. The plan should identify domestic and irrigation supply wells within 150 feet of blasting activities and outline the procedures that Mojave would use with the well owner's permission to**

conduct pre- and postconstruction monitoring of well water quality and yield. Within 30 days of placing the pipeline facilities in service, Mojave should file a report with the FERC and SLC discussing any complaints concerning well water quality or yield and how they were resolved.

Trench dewatering could affect groundwater or nearby surface water in areas where shallow groundwater has been identified as potentially contaminated or listed as being of poor quality. Mojave would implement mitigation measures such as predischarge testing and proper disposal as designated in its NPDES and Waste Discharge Requirements permits issued by the RWQCB.

The proposed pipeline would cross a sole-source aquifer (SSA) in Fresno County. The SSA designation requires the EPA to review all Federal financially assisted projects in the area to ensure that their design and construction would not cause significant impact on the aquifer. The proposed project is not a Federal financially assisted project; therefore, SSA regulations do not apply. Because of the depth of this aquifer, project construction would not affect it.

5.3.3 Surface Water

5.3.3.1 General Impact and Mitigation

The pipeline construction activities that could affect surface waters are clearing and grading of rights-of-way at or near streambanks, in-stream construction, hydrostatic testing, trench dewatering, and hazardous material spills. These activities could result in modification of aquatic habitat, increased sedimentation and turbidity, decreased dissolved oxygen concentrations, stream warming, and releases of chemical and nutrient pollutants.

In response to concerns raised by Federal, state, and local agencies regarding the potential environmental impact of pipeline projects in general, the FERC staff developed the Wetland and Waterbody Construction and Mitigation Procedures (Procedures) in appendix C to provide protection for surface waters that could be affected. These waters include any stream or river with perceptible flow at the time of crossing as well as other permanent waterbodies such as ponds and lakes. In developing the Procedures, we evaluated the effectiveness of various crossing methods including open-cut and boring techniques in mitigating potential impact on surface waters. Although boring and horizontally controlled drilling techniques avoid in-stream construction, these methods are often not technically feasible for crossing many waterbodies.

Mojave has agreed to incorporate the Procedures into its general construction plans. In general, the potential effects of pipeline construction on surface waters would be successfully mitigated to less-than-significant levels by adhering to these procedures. In addition, Mojave would need to obtain stream-crossing permits from the USACE under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. Water Quality Certification and Stream Alteration Agreements would need to be obtained from the RWQCB and DFG, respectively. Encroachment permits from the California Reclamation Board (CRB) also may be needed for crossing streams regulated by the CRB (see table 4.3.2-1). These permits and agreements would include any additional mitigation measures the agencies would require to ensure that the natural resources and flood control facilities are protected.

Some of the relevant mitigation measures specified in the Procedures are:

- Locating staging areas at least 50 feet from the waterline on both sides of a wetland or waterbody crossing. At the crossing of a minor or intermediate stream (i.e., a stream less than 100 feet wide), the staging areas would be 40 feet wider than the construction right-of-way for 100 feet along the right-of-way beginning 50 feet from the waterline. At the crossing of a major stream or river, the staging areas would be 50 feet wider than the right-of-way for 500 feet. If topography or other factors prevent locating a staging area at least 50 feet from the waterline, the staging area would be permitted no closer than 10 feet from the waterline.

- If more space is found to be needed during construction, stopping work and submitting a site-specific construction plan to the FERC for approval before resuming construction.

- Not clearing vegetation between the staging areas and the waterbody.

- Complying with Section 404 nationwide permit program conditions at a minimum.

- Temporarily stockpiling excavated material, called spoil, at least 10 feet from streambanks; using sediment filter devices to prevent the spoil from returning to the stream during construction; and returning spoil removed from a dry wash or intermittent stream to the ditch after the pipe is laid.

- Ensuring that construction equipment except that used by clearing crews cross waterbodies on bridges.

- Completing trenching and pipeline installation across a minor stream within 24 hours unless blasting were required and across an intermediate stream (between 10 and 100 feet wide) within 48 hours.

- Stabilizing and returning streambanks to preconstruction contours.

- Revegetating disturbed riparian areas with native trees and shrubs as well as conservation grasses.

- Maintaining sediment filter devices at all streambanks until revegetation of the right-of-way has been judged successful.

Clearing and Grading

Clearing and grading of rights-of-way could increase surface runoff, erosion, and subsequent offsite sedimentation. The magnitude of the increase would depend on the inherent erodibility of the soils and the size of the runoff contribution area upslope. Surface runoff and erosion could cause short-term increases in the sediment load of streams and the erosion potential of streambanks. An increased sediment load could degrade surface water quality and affect fish and other aquatic organisms. Mitigation for soil erosion was discussed in section 5.2.2.

In-Stream Construction

In-stream construction could cause the dislodging and transport of channel bed sediments and the alteration of stream contours. Increases in turbidity and sedimentation resulting from trenching, backfilling, or in-stream movement of construction equipment could affect light penetration and photosynthetic oxygen production, raise the water temperature, and release chemical and nutrient pollutants from sediments. These effects would tend to reduce the amount of dissolved oxygen in the water, which could adversely affect the habitat value of the resource. Chemical pollutants reintroduced into the water column by disturbing contaminated sediments could adversely affect stream biota. In general, turbidity and sedimentation increases would be temporary or short-term and would be minimized by constructing stream crossings during low-flow and nonspawning periods or by horizontally drilling beneath stream channels. Long-term effects could result from altering stream geometry by disrupting the balance between stream discharge, sediment transported, and the size of sediment making up the stream bed, which could result in either accelerated erosion or deposition.

Streambed scour due to stream flows from extreme storm events can be expected to occur at some of the crossings. Strategies for mitigating the scour at the pipeline crossings include performing engineering analyses to estimate the expected scour depth of the chosen design storm and then constructing the crossing so that it is lower than the expected scour and an additional factor of safety. Alternatively, rip-rap large enough to withstand the design storm flow can be emplaced to protect the pipeline. Additionally, the strategies include avoiding crossing streams at a bend and using construction techniques that would minimize disturbance of the channel material and vegetation at the stream crossing.

Hydrostatic Testing and Trench Dewatering

The withdrawal of water from streams or rivers to use for hydrostatic testing could reduce the amount of water available for downstream uses and adversely affect aquatic habitats. The discharge of hydrostatic test water and water from trench dewatering could increase erosion and downstream sedimentation and lead to the deterioration of receiving water quality.

The pipeline would be hydrostatically tested in accordance with DOT Office of Pipeline Safety standards (49 CFR 192) and the Procedures (appendix C). Although Mojave has not yet determined the specific sources of test water or discharge locations, the water would be obtained from local water districts near the pipeline section being tested. A maximum of about 0.6 acre-foot of water per mile would be required for a 30-inch-diameter pipeline.

The EPA has delegated authority to issue NPDES permits under the Clean Water Act, Section 402, to the CSWRCB, and the permits are administered by the RWQCBs. Mojave would need CSWRCB approval of its test water source as well as its test water and trench dewatering discharge sites prior to use. The CSWRCB approval for a given discharge would include levels for contaminants that could not be exceeded in the water to be discharged, and Mojave would ensure that permitted levels are not exceeded.

To meet the EPA's National Storm Water Program General Permit requirements, Mojave would prepare a Storm Water Pollution Prevention Plan (SWPP Plan) that would indicate the procedures that would be used to keep sediment-laden runoff from entering streams and storm drains. The plan would be required to be kept onsite with the contractor's other project certifications. Mojave would need to obtain an NPDES permit from the RWQCB to discharge to a waterbody or a Waste Discharge Requirements permit to discharge to land.

Hazardous Materials Spills

Spills or leaks of fuels or lubricants could contaminate surface waters or shallow aquifers. The measures for preventing and cleaning up any spill that might occur and for minimizing its potential to enter runoff waters were discussed in section 5.3.2.1 and are described in Mojave's SPCC plan. The plan does not identify the types and quantities of fuels, lubricants, and other hazardous materials that would be stored or used in the rights-of-way and stockpile areas or the types of containers that would be used to store these materials. See our recommendation in section 5.3.2.1.

Floodplains

The proposed pipeline would be buried below natural grade; therefore, the pipeline would not result in any change or enlargement of existing floodplain areas, cause any changes in existing runoff volumes or drainage patterns, or create new flood hazards. The aboveground facilities include block valves, compressor stations, and meter stations. These facilities would be located primarily outside 100-year floodplains. Any facilities that must be located in a 100-year floodplain would be designed to minimize any interference in flow patterns that might increase erosion or scour.

5.3.3.2 Site-Specific Impact and Mitigation

Major Surface Water Crossings

The proposed route crosses the San Joaquin River twice, once at the Fresno-Madera County line and once just east of Tracy. The USACE considers the San Joaquin River to be navigable, by the Federal definition under Section 10 of the Rivers and Harbors Act, upstream to a point 7 miles downstream from Highway 99, the southernmost of the two crossings. Recreational boating and fishing could occur farther upstream depending on flow rates (O'Leary, 1994).

The proposed route includes 12 crossings of major rivers and streams, i.e., streams wider than 100 feet, as shown in table 5.3.3.2-1. The San Joaquin and Kings Rivers are each crossed twice. Mojave proposes to directionally drill under the channels and adjacent riparian vegetation at each of these crossings, which would minimize the effects on water quality, aquatic life, and adjacent riparian vegetation.

Ten of the 12 crossings identified in table 5.3.3.2-1 involve streams and rivers regulated by the CRB. The CRB exercises jurisdiction over the levee section, the waterward area between the levees, a 10-foot-wide strip adjacent to the landward levee toe, within 30 feet of the top of the banks of unleveed regulated channels, and within designated floodways adopted by the CRB. Encroachment permits will be required for any crossings that involve construction activities within these limits.

◆ **We recommend that Mojave file with the FERC and SLC prior to construction, a site-specific construction plan for all directional drilling sites. This plan should:**

- **Include detailed schematics of each site including the identification of existing vegetation, locations of staging areas, drilling mud and wastewater containment structures, and sediment control devices.**
- **Address how Mojave would contain and clean up any inadvertent release of drilling mud into the waterbody or areas adjacent to the waterbody.**

TABLE 5.3.3.2-1

Major Rivers and Streams Crossed by the Proposed Route Where Directional Drilling is Proposed

Segment/Milepost a/	Name	Regulated by Reclamation Board	Average Flow (CFS)
North Mainline			
88.5/97.1	Kings River	Yes	24.5
121.7/130.2	San Joaquin River	Yes	126 b/
182.2/190.8	Merced River	Yes	94
203.3/212.0	Tuolumne River	Yes	1,363
215.6/224.1	Stanislaus River	Yes	999
222.1/230.6	San Joaquin River	Yes	4,540
288.3/297.2	Pacheco Creek	No	---
Sacramento Mainline			
23.5	Calaveras River	Yes	---
31.4	Mokelumne River	Yes	591
49.8	Cosummes River	Yes	487
Coalinga Segment			
25.3	North Kings River	Yes	24.5 c/
Palo Alto Segment			
32.4	Guadalupe River	No	16.6

---

a/ Where two milepost numbers are given separated by a slash, the first number is the milepost in the pipeline configuration to serve Alternative Customer Group 1 in addition to the Core Customer Group, and the second number is the milepost in the pipeline configuration to serve Alternative Customer Group 2 in addition to the Core Customer Group. Where only one milepost number is given, the pipeline configuration would be the same in that area to serve both alternative customer groups. Where no number is given before or after the slash, the entry only applies to one configuration or the other.

b/ Data averaged for 1988 and 1991 only; other records include upstream diversions (USGS, 1989).

c/ Kings River data are not reported as North Kings River.

CFS = Cubic feet per second.

Mojave has not yet conducted geotechnical testing to evaluate the feasibility of employing horizontally controlled, directional drilling technology at these crossings. Our experience has been that directional drilling can fail in three ways: (1) uncontrolled releases of drilling mud into the waterbody can result through unidentified fractures in the material underlying the riverbed; (2) the drill head may encounter obstacles that push the drill out of alignment, causing it to exit into the waterbody; or (3) the boring cannot be successfully completed.

In the event that directional drilling is not technically feasible or could not be completed at any of these waterbodies, Mojave would need to complete the crossings using the open-cut method. Because these streams are considered sensitive, we want an opportunity to review the construction plans and to consider the impact associated with open-cut crossings.

◆ **We recommend that Mojave file with the FERC and SLC an open-cut crossing plan for each waterbody listed in table 5.3.3.2-1 if the directional drilling of the waterbody is unsuccessful. The Director of the Office of Pipeline Regulation must review and approve these plans in writing before construction of each open-cut crossing. The plans should be site-specific and include:**

- **The specific reasons that the directional drilling technique was not successful.**
- **How Mojave would seal the abandoned drill hole.**
- **Scaled drawings identifying all areas that would be disturbed by constructing the open-cut crossing.**
- **Copies of the required state and USACE permits authorizing the construction of the waterbody crossings using the open-cut method.**

Public Water Supplies

There are no public water supply intakes within 3 miles downstream of any proposed waterbody crossing. All water supply canals and aqueducts would be bored or bridged.

Irrigation Districts

The proposed route crosses numerous irrigation districts in the Central Valley, which is laced with canals and ditches operated by local irrigation districts to provide water for irrigation and to remove excess drainage. Mojave has indicated that it would slick-bore beneath most canals, particularly when crossing lined canals, but the California Aqueduct and Delta Mendota Canal would be bridged. Encroachment permits would be required from the BOR or California Department of Water Resources for Federal or state aqueduct crossings. Any open-cut crossing of a canal would be done when the canal is empty. Mojave would also:

- Coordinate any necessary irrigation system water shutoffs with the affected parties.
- Be responsible for any damages that might result from a project-related interruption in an irrigation system.

- Upon completion of the crossing, compact the bottom and banks of the canal and restore them to preconstruction conditions.
- Dewater trenches only to the extent required for pipe installation.
- Place trench backfill in lifts to allow removal of the piling and compaction of the fill material as necessary.

The specific mitigation measures Mojave would use to protect levees would depend on the soil stability and water level and could include:

- Maximizing the distance between the edge of the trench and the toe of the levee.
- Sloping the sides of the trench to support the levee where stable soils exist.
- Providing shoring where adequate support could not be provided through sloping the sides of the trench; the shoring would be continuous where water intrusions are anticipated.
- Using a system of interlocking steel sheet pilings where saturated or unstable soils are encountered.
- Where the pipeline would be in a levee, locating the trench as near to the center of the levee as possible.

Coastal Zone Areas

The proposed route crosses one or more areas in the San Francisco Bay Area that may fall under the jurisdiction of the San Francisco Bay Conservation and Development Commission (BCDC). The BCDC is responsible for making determinations of consistency under the Federal Coastal Zone Management Act in areas within their jurisdiction. The BCDC has regulatory authority over all areas in the Bay up to the high tide line, all areas formerly subject to tidal action that have been filled since 1965, and a "shoreland band" that extends 100 feet inland from these areas. BCDC permits may be required for the following: North Mainline from MP 277.6/286.4 to the end; the Oakland Segment from MP 22.6 to the end; the entire Fremont Segment; the Palo Alto Segment from MP 24 to MP 30.2 and MP 40.0 to MP 47.0; and the Hunters Point Segment from MP 2.0 to MP 19.0, MP 20.0 to MP 22.0, and MP 23.0 to the end. Mojave will continue consultations with the BCDC regarding the proposed route.

To ensure that Mojave's project would be consistent with any of California's coastal resource and development policies:

♦ **We recommend that, prior to constructing facilities in the California coastal zone, Mojave be required to file with the FERC and SLC a statement from the BCDC that the project is consistent with the California Coastal Zone Management Plan.**

Reservoirs

The proposed route is near the Contra Loma and Mallard Reservoirs in Contra Costa County and crosses the watershed draining into the Contra Loma Reservoir. Mojave would follow the erosion control procedures in appendix A including installing trench breakers to prevent subsurface channeling of water along the trench, setting up sediment barriers to prevent runoff from carrying sediment downslope to the reservoir, and regrading and contouring the trench to blend into the hillside. These mitigation measures would reduce impact on the reservoirs. The proposed route passes downslope from the levee of the Mallard Reservoir, but Mojave would follow the levee protection measures discussed above to minimize the impact on the reservoir. The Alameda County Water District has suggested realigning the section of the Fremont Segment from the north to the south side of the railroad right-of-way. This would avoid compromising the stability of the cliff edge of the groundwater recharge basin that is about 50 feet north of the railroad bed. See section 3.4 for further discussion.

Acid Mine Runoff

No specific locations have been identified where the proposed route crosses areas of direct acid runoff from abandoned surface mines. If areas of suspected acid runoff are encountered, Mojave would:

- Use a pH meter to evaluate the acidity of the runoff.
- If the measured pH is significantly less than the average pH of surface water or groundwater in the project area, report the results to the RWQCB and implement the appropriate site-specific mitigation measures agreed on with the RWQCB.

5.4 VEGETATION

5.4.1 Criteria for Evaluating Impact and Determining Significance

Adverse impact on vegetation is considered significant and would require additional mitigation if project construction or operation would:

- Disturb a substantial portion of a common vegetation type within a local region and natural or enhanced regeneration could not restore this vegetation to its preconstruction condition within 3 years.
- Result in the long-term substantial alteration of unique, rare, or special-concern vegetation types (e.g., riparian vegetation) or natural communities.
- Lead to the expanded range of existing noxious weed species or soil pests so that they interfere with crop production or successful revegetation.

Because of additional regulations and concerns based specifically on wetland disturbance, additional criteria have been developed to evaluate impact on wetlands and determine its significance. Adverse impact on wetland resources is considered significant and would require additional mitigation if project construction or operation would:

- Fill or alter a wetland, resulting in a long-term change in hydrology, soils, or the composition of vegetation.
- Result in the substantial alteration of a unique, rare, or special-concern wetland community.
- Permanently convert more than 10 acres of forested wetlands to herbaceous and/or scrub-shrub habitats (cumulative for the project).
- Cause short-term or long-term violations of Federal or state water quality standards for streams that lead to wetlands measured as in-stream elevated turbidity readings or decreased dissolved oxygen levels.

5.4.2 General Impact and Mitigation

Impact on vegetation could be short- or long-term and would result in the alteration or loss of vegetative cover. Short-term impact associated with construction would include clearing and grading of a 30- to 75-foot-wide right-of-way to allow access for construction equipment. Clearing and grading of extra workspace could also be necessary for additional equipment and materials near road and stream crossings. Long-term impact would be associated with the maintenance of a 10-foot-wide, permanent right-of-way in riparian woodlands. Permanent impact would occur at the three new compressor stations, which would occupy 17 to 20 acres each.

To mitigate impact on vegetation, Mojave would implement the FERC staff's Erosion Control, Revegetation, and Maintenance Plan (Plan) in appendix A and Wetland and Waterbody Construction and Mitigation Procedures (Procedures) in appendix C. Other mitigation measures that Mojave would implement are:

- Identifying noxious weeds during preconstruction surveys; where noxious weeds are found, following the recommendations of county agricultural commissioners to eradicate and prevent the spread of the weeds including rinsing vehicles before leaving the immediate vicinity of the noxious weeds; and postconstruction surveillance of the right-of-way to determine whether control has been effective or whether additional measures are necessary.

- Making minor route realignments in riparian and oak woodland communities to avoid disturbing trees.

- Limiting the maintained right-of-way width to 10 feet in wooded riparian areas.

- Directionally drilling major stream crossings to avoid impact on associated riparian habitat.

The Project Revegetation Requirements (Requirements) in appendix B generally outline the required seed mixes and application rates, seedbed preparation procedures, tree and shrub replanting locations, and planting timeframes. The Requirements include revegetation methods proposed by Mojave as well as additional methods that the staff of the FERC and SLC believe are necessary to mitigate construction-related impact on all natural vegetative communities affected by the proposed project. The additional revegetation methods include:

- Seeding and mulching all natural vegetative communities except Mojave Desert scrub and riparian herbaceous communities and within 50 feet of vernal pools.

- More extensive salvaging and onsite replacement of vegetation removed from riparian areas at a ratio of 3:1.

- Replacing oaks larger than 6 inches in diameter at breast height (dbh) at a ratio of 30:1, i.e., 10 plantings of three acorns each for each oak removed, and protecting the plantings against predation and grazing for at least 5 years or until survival is ensured.

- Enhancing the predominant seed mixes for each community by using native forbs from adjacent communities and ensuring that locally adapted genotypes are represented.

- Following revegetation of the construction right-of-way, monitoring revegetation success for 2 years for herbaceous vegetation, 3 years for wetlands and riparian areas, and 5 years for oak woodlands.

◆ **We recommend that Mojave restore all areas disturbed by the construction of its project in accordance with the Project Revegetation Requirements in appendix B.** 1/

1/ The FERC and SLC staffs will recommend to their respective Commissions that their additional mitigation measures (offset in boldface type in the text) be included as specific conditions to any approving Certificate issued for Mojave's project. The staffs will also recommend that Mojave be required to implement the mitigation measures that Mojave has proposed as part of the project unless specifically modified by other Certificate conditions.

Wetlands

The primary impact of pipeline construction on wetlands would be the temporary and long-term alteration of wetland vegetation. Additional impact could include changes in wetland hydrology, water quality, and aesthetic values and the degradation of fish and wildlife habitat. Construction would result in no "net loss" of wetlands because none would be permanently drained or filled. Implementation of the Procedures would ensure that impact on wetlands would be short-term. Long-term impact would be limited to the alteration of wooded riparian areas within the permanently maintained, 10-foot-wide right-of-way.

The removal of existing vegetation from the construction right-of-way could result in the postconstruction growth of undesirable plant species. Although herbaceous wetlands tend to revegetate relatively quickly, long-term effects are likely where construction would remove mature forested wetlands. Pipeline construction could alter wetland hydrology and water quality by changing surface and subsurface drainage patterns and by penetrating hydric soils. Soil compaction and rutting resulting from spoil pile placement and the movement of heavy machinery could alter surface water drainage. Excessive crowning of backfill in the trench could alter surface runoff flow patterns. Pipeline trenches could act as subsurface drainage conduits, or the pipe and backfill could prevent natural subsurface water movement. Trench excavation could break through impermeable soil layers that are key to maintaining wetland conditions. Soil disturbance along wetland perimeters could increase the sediment load entering the wetlands. Soil mixing during excavation could result in lower soil fertility.

Mojave has committed to implementing the FERC staff's Procedures (appendix C) to reduce or eliminate the potential impact on wetlands. As discussed in section 5.3.3.1, the FERC staff developed the Procedures in response to concerns raised by Federal, state, and local agencies to provide minimum protection for surface waters. Mojave would apply for all necessary permits and approvals before constructing wetland crossings. The USACE has not yet determined whether a single or several Section 404 permits would be required for the proposed project or whether the project could be constructed under the Nationwide Section 404 Permit Program. In the event that individual Section 404 permits are required, a Section 404(b)(1) guidelines analysis would be conducted by the USACE to ensure that the discharge of dredged and fill materials would be minimized and that all practical construction alternatives have been used. These guidelines require that dredged or fill materials not: violate state water quality or toxic effluent standards; jeopardize the existence of species listed as endangered or threatened under the ESA; cause significant degradation to waters of the United States as demonstrated by chemical testing; or result in significantly adverse individual or cumulative effects on human health or welfare, aquatic life or wildlife dependent on aquatic ecosystems, or recreation, aesthetic, or economic values. As a result of any USACE analysis, additional conditions could be imposed on the wetland crossings.

Mojave would identify all Federal jurisdictional wetlands using the USACE methods described in section 4.4. The FERC would require that the Procedures in appendix C be used when crossing jurisdictional wetlands. According to these Procedures, construction through wetlands must, at a minimum, comply with Nationwide Section 404 permit conditions. The Procedures include:

- Using the minimum required right-of-way and disturbing as little vegetation as possible.
- Using only existing roads or the pipeline right-of-way for access into wetlands.
- Limiting entry of equipment into wetlands.

- Locating staging areas at least 50 feet from wetland boundaries.

- Using adequate erosion and sediment control measures to prevent soil from flowing off the right-of-way.

- Storing fuel and refueling equipment at least 100 feet from wetland boundaries.

- Limiting the pulling of tree stumps and grading to directly over the trench and, whenever possible, leaving root systems intact.

- Segregating the top foot of topsoil and returning it to its original position when backfilling the trench.

- If standing water or saturated soils are present, using low-ground-weight equipment or operating equipment on timber riprap, equipment mats, or geotextile fabric and gravel fill.

- Removing all timber riprap, equipment mats, geotextile fabric, and gravel fill upon completing the crossing.

- Installing and maintaining temporary sediment filter devices in the right-of-way until revegetation has been successful.

- Installing trench and slope breakers and/or sealing the trench bottom to maintain the original wetland hydrology.

- Revegetating with native wetland species while preventing the invasion of undesirable, exotic species.

◆ **We recommend that Mojave use the FERC staff's Wetland and Waterbody Construction and Mitigation Procedures in appendix C when crossing the following sensitive habitats even if they do not meet the U.S. Army Crops of Engineers' criteria for jurisdictional wetlands: riparian areas, seasonal wetlands, vernal pools, and nonnatural ponding areas containing sensitive invertebrate species.**

5.4.3 Site-Specific Impact and Mitigation

The impact of construction and maintenance activities on vegetation would vary with the vegetative community affected. For example, nonnative grasslands would be expected to recover relatively quickly as opposed to some desert scrub communities, which could take 50 years or longer to recover. Table 5.4.3-1 at the end of section 5.4 gives the acreages of the various vegetation types that would be affected by the clearing and maintenance of a permanent right-of-way. These acreage estimates assume that the construction right-of-way would not overlap with existing linear corridors and are, therefore, worst-case estimates. The temporary and long-term impact on the vegetative communities in each physiographic province is discussed below.

5.4.3.1 Mojave Desert

Ruderal Communities

Construction of the proposed project would result in the temporary disturbance of previously disturbed ruderal communities. Much of the ruderal land crossed in the Mojave Desert is existing pipeline right-of-way. Mojave would restore other ruderal lands to preconstruction conditions according to landowner requests. All restoration would be subject to FERC and SLC approval.

Agricultural Communities

There is little cultivated land along the proposed route through the Mojave Desert.

Natural Communities — Mojave Desert Scrub

Loops 1, 2, and 3 would affect approximately 697 acres of Mojave Desert scrub communities including Mojave wash scrub and Mojave creosote bush scrub subcommunities. Recovery could take 20 to 50 years. These communities provide habitat for the desert tortoise, which is a Federal- and state-listed threatened species. This impact on Mojave Desert scrub communities would be long-term and significant because of the long-term loss of both vegetation and habitat. Permanent impact would occur on a total of 37 acres at the Amboy and Daggett Compressor Stations, and the loops would affect up to 734 acres of existing right-of-way. Of these acres, 182 would not be previously disturbed, and, where desert scrub communities would be affected, the impact would be long-term and significant. The remaining 558 acres would be within previously disturbed, 50-foot-wide right-of-way; the long-term habitat loss was compensated as part of the original Mojave Mainline project.

To mitigate impact on Mojave desert scrub communities, Mojave would implement the following measures:

- Minimize blading, leaving root crowns intact to enable some species to recover more quickly.
- Segregate and properly restore topsoil and seed banks.
- Create favorable conditions for seedling establishment by imprinting.
- Salvage and replant Joshua trees, yuccas, and cactus.
- Provide compensation funds or acreage for sensitive species habitat loss in consultation with the regulatory agencies (see section 5.6).

Because of the slow growth of Joshua trees, which provide habitat value for nesting birds, their removal would be considered a long-term impact.

◆ **We recommend that any Joshua trees taller than 8 feet be avoided by construction activities and that any salvaged Joshua trees, yuccas, and cacti be replaced in the right-of-way immediately after the subsoil and topsoil are backfilled into the trench.**

5.4.3.2 Central Valley

Ruderal Communities

Impact and mitigation in ruderal communities in the Central Valley would generally be as discussed in section 5.4.3.1 for ruderal communities in the Mojave Desert.

Agricultural Communities

Construction through agricultural lands would cause long-term impact on almond and walnut orchards because a treeless, 10-foot-wide centerline would be permanently maintained, and the reestablishment of fruit-bearing trees in the rest of the permanent right-of-way would require an extended period of time. In vineyards, Mojave would allow the reestablishment of producing vines in the centerline, but growth, maturation, and, fruit production would require several years. Cropland and pastureland would only be affected for one growing season. To mitigate impact on agricultural lands, Mojave would use full-width topsoil stripping in the entire right-of-way, which would require the expansion of the construction right-of-way by 25 feet. Mojave would compensate landowners for lost revenue from the construction right-of-way.

Natural Communities

Nonnative Grasslands — Construction could affect up to 242 acres of nonnative grasslands, the most prevalent natural community type crossed by the proposed route through the Central Valley. The impact would be short-term and due primarily to construction and future maintenance activities. With appropriate restoration, preconstruction conditions would be restored rapidly. The proposed route is within existing railroad rights-of-way to the extent possible. In addition to general mitigation measures discussed in section 5.4.2, Mojave would mitigate impact on nonnative grasslands as follows:

- Salvage and replace topsoil in the construction right-of-way.
- Seed areas of slope instability or potential erosion problems.
- Provide compensation acreage, calculated in consultation with the regulatory agencies, where nonnative grasslands supporting sensitive species could not be avoided (see section 5.6).

Chenopod Scrub Communities — Construction would impact 41 acres of chenopod scrub communities along the North Mainline and Coalinga Segment. The impact would be long-term because chenopod scrub requires as long as 20 years to reestablish following disturbance. Because of its linear nature and minimal width, the disturbance is expected to have a minimal effect on the regional chenopod scrub population. Chenopod scrub communities do provide habitat for sensitive species including blunt-nosed leopard lizard and Tipton kangaroo rat (see section 5.6). To mitigate the impact on chenopod scrub communities, Mojave would:

- Segregate, salvage, and replace topsoil in the construction right-of-way.
- Recontour, imprint, seed, and mulch according to the Project Revegetation Requirements in appendix B.

Wetland Communities — Construction would impact up to 26.3 acres of wetlands and 28.7 acres of nonnatural ponding areas in the Central Valley. Table 5.4.3.2-1 summarizes the affected acreages; the acreages are net wetland areas affected after taking into account channel widths and stream crossings that would be directionally drilled. Tables 4.4-1 and 4.4-2 indicate where directional drilling would be used and the channel widths for riparian stream crossings. The general mitigation measures discussed in section 5.4.2 for wetlands would be used in all wetland types discussed below. These mitigation measures will reduce the impact to less than significant. Construction would affect up to 9.5 acres of **riparian woodlands**. Because of their linear nature, it is not possible to route around riparian areas; however, if considered extremely valuable, they could be avoided by directional drilling. Impact on riparian woodlands would be permanent where woody vegetation would not be allowed to reestablish, i.e., within the 10-foot-wide centerline, a total of 1.41 acres. To minimize impact on riparian woodlands, we have recommended that Mojave implement the FERC staff's Procedures in appendix C. Additionally, Mojave would:

- Where feasible, make minor route realignments to avoid riparian woodlands.
- Directionally drill major stream crossings.
- Provide compensation or acreage calculated in consultation with the regulatory agencies, where riparian habitat supporting sensitive species could not be avoided (see section 5.6).
- Limit the maintained right-of-way in heavily wooded riparian areas to 10 feet wide.

As discussed in the Project Revegetation Requirements (appendix B), the woody riparian plants would be replaced onsite at a ratio of 3:1. Additional mitigation for woody riparian vegetation could be required in the form of offsite compensation depending on an evaluation of habitat values that would be lost.

Construction would affect up to 3.2 acres of **riparian scrub-shrub communities**. The impact would be short-term because the vegetation would reestablish within a few years. To mitigate the impact, Mojave would implement the general mitigation measures discussed in section 5.4.2.

Construction would affect up to 2.7 acres of **riparian herbaceous communities**. The impact would be short-term because the right-of-way would be restored to preconstruction conditions. To mitigate the impact, Mojave would implement the general mitigation measures discussed in section 5.4.2.

Construction could affect 9.4 acres of **seasonal wetlands** in the Central Valley. These isolated areas are generally distributed throughout the nonnative grasslands. The impact on seasonal wetlands would be short-term because the preconstruction vegetation would reestablish following construction. To mitigate the impact, Mojave would implement the general mitigation measures discussed in section 5.4.2.

Vernal pools are found in nonnative grasslands in the Central Valley. As discussed in section 5.6, they are important habitats for plant and animal species, and four species of vernal pool fairy shrimp have recently been listed by the FWS as threatened or endangered species. Mojave has proposed avoiding all vernal pools; however, the detailed engineering of the proposed route has not been completed

TABLE 5.4.3.2-1

Central Valley Wetlands

Wetland Type	Acres Affected by Core Project Plus Additional Facilities to Serve Alternative Customer Group 1	 Alternative Customer Group 2
Riparian woodlands	7.7	9.5
Riparian scrub-shrub communities	2.8	3.2
Riparian herbaceous communities	2.2	2.7
Seasonal wetlands	9.4	9.4
Vernal pools	0.5	1.5
Total wetlands	22.6	26.3
Nonnatural ponding areas	28.7	28.7

so total avoidance is not certain. Using the right-of-way widths in Mojave's application, the avoidance of 1.6 acres of vernal pools is in question. Because the hydrology of vernal pools is very sensitive to disturbance and restoration efforts have historically had limited success, the impact on these 1.6 acres, if they cannot be avoided, could be permanent. To mitigate impact on vernal pools, Mojave would:

- Realign the proposed route or narrow the construction right-of-way to avoid vernal pools wherever possible.
- Where avoidance is not possible, provide compensation acreage calculated in consultation with the regulatory agencies (see section 5.6).
- Avoid seeding of adjacent grassland within 50 feet of vernal pools; rather, salvage and stockpile the seedbank-containing topsoil for subsequent replacement in the right-of-way at least 50 feet from vernal pools.

Because vernal pool creation is an experimental procedure and reestablishment success is uncertain, avoidance is by far the preferred mitigation measure compensatory acreage could be required.

◆ **Where Mojave is unable to avoid vernal pools by realigning or narrowing the right-of-way, we recommend that Mojave attempt to install its pipeline across these areas using the horizontal boring or directional drilling method.**

◆ **If avoidance of vernal pools by any means is not feasible, we recommend that Mojave file with the FERC and SLC a site-specific vernal pool restoration plan developed in consultation with the USACE, FWS, and DFG that includes:**

- **Identifies the acreage and habitat value of the vernal pools that could not be avoided.**
- **Details the procedures that Mojave would use to restore the hardpan layer.**
- **Includes a postconstruction monitoring program with restoration success criteria based on adjacent undamaged vernal pools.**
- **Establishes a protocol for identifying offsite compensatory acreage of "in-kind" habitat at a ratio of 4:1.**

The impact on the 28.7 acres of nonnatural ponding areas would be considered significant if, during preconstruction surveys, populations of sensitive species are found to be using these areas. The impact would be short-term and due primarily to construction activities. Mitigation would consist of restoring nonnatural ponding areas used by sensitive species to their preconstruction conditions. Impact on nonnatural ponding areas not used by sensitive species would not be mitigated. Because nonnatural ponding areas would only be significant if sensitive species were present, the potentially affected acreage was not included in the total wetland acreage in table 5.4.3.2-1. We have recommended that Mojave use the Procedures in appendix C when constructing through nonnatural ponding areas containing sensitive invertebrates.

5.4.3.3 Coast Ranges - San Francisco Bay Area

Ruderal Communities

Impact and mitigation in ruderal communities in the Coast Ranges-San Francisco Bay Area would generally be as discussed in section 5.4.3.1 for ruderal communities in the Mojave Desert.

Agricultural Communities

Impact and mitigation in agricultural communities in the Coast Ranges-San Francisco Bay Area would generally be as discussed in section 5.4.3.2 for agricultural communities in the Central Valley.

Natural Communities

Up to 630 acres of **nonnative grasslands** could be affected by construction. The impact would be the same as described for nonnative grasslands in the Central Valley in section 5.4.3.2. The mitigation measures would also be the same.

About 40 acres of **foothill woodlands** could be affected by construction on the proposed route. The typical foothill woodland community consists of widely spaced trees and is similar to a savannah. Foothill woodlands are considered significant because of their importance as wildlife habitat and their relative scarcity in the Coast Ranges-San Francisco Bay Area. In addition to general mitigation measures and the measures contained in the Project Revegetation Requirements in appendix B discussed in section 5.4.2, to mitigate impact on foothill woodlands, Mojave would:

- Make minor route realignments or narrow the right-of-way to avoid stands of trees, which are both feasible because of the openness of these woodlands.
- Salvage and replace topsoil.
- Seed areas of slope instability or potential erosion problems.
- Limit the pulling of tree stumps and grading to directly over the trench and, whenever possible, leave root systems intact.

♦ **To further minimize long-term impact on this sensitive habitat, we recommend that:**

- **Prior to construction, Mojave submit to the FERC and SLC for their approval a report citing the locations where avoidance of specimen oak trees in foothill woodlands is not possible and a site-specific explanation of each removal; native oaks larger than 12 inches diameter at breast height (dbh) are considered specimen trees and should be avoided if at all possible.**
- **Restoration of foothill woodlands including nonnative grassland groundcover adhere to the Project Revegetation Requirements in appendix B.**

Wetlands — Construction of the proposed project would affect up to 41.9 acres of wetlands in the Coast Ranges-San Francisco Bay Area including riparian communities, seasonal wetlands, vernal pools, alkali lowlands, and coastal brackish marshes as summarized in table 5.4.3.3-1. Impact and mitigation would be as described in section 5.4.3.2 for wetlands in the Central Valley.

The impact on **riparian woodlands** in the Coast Ranges-San Francisco Bay Area and the associated mitigation would be as discussed for the Central Valley in section 4.5.3.2. Mitigation is further addressed in appendices B and C. Construction could impact up to 1.8 acres of riparian woodlands; up to 0.5 acre would be permanently impacted because woody vegetation would not be allowed to reestablish in a 10-foot-wide centerline.

As discussed in the Project Revegetation Requirements (appendix B), we require that woody riparian trees or shrubs be replaced onsite at a ratio of 3:1. Additional mitigation for woody riparian vegetation could be required in the form of offsite compensation depending on an evaluation of habitat values that would be lost.

Construction could impact up to 2.2 acres of **riparian scrub-shrub communities** in the Coast Ranges-San Francisco Bay Area. The impact and mitigation as discussed for the Central Valley in section 5.4.3.2.

Construction would impact 0.1 acre of **riparian herbaceous communities** in the Coast Ranges-San Francisco Bay Area. The impact and mitigation would be as discussed for the Central Valley in section 5.4.3.2.

Construction could impact up to 3.3 acres of **seasonal wetlands** along the Hunters Point Segment. The impact and mitigation would be as discussed for the Central Valley in section 5.4.3.2.

Any construction through vernal pools would result in significant impact because of their importance as habitat as discussed in section 5.4.3.2. About 0.3 acre of vernal pools could be affected. The impact and mitigation would be as discussed for the Central Valley in section 5.4.3.2.

No **nonnatural ponding areas** were identified in the Coast Ranges-San Francisco Bay Area.

Alkali lowlands are found in the Livermore Valley and throughout the Coast Ranges. About 14.0 acres would be disturbed by construction. The impact would be short-term because native species would be favored during revegetation rather than other common plant species as stipulated in the Procedures in appendix C.

Up to 20.2 acres of **coastal brackish marshes** would be disturbed by construction. The effects would be localized and short-term, i.e., until the onsite vegetation naturally reestablishes. Implementation of the Procedures in appendix C would minimize the impact.

TABLE 5.4.3.3-1

Wetlands in the Coast Ranges - San Francisco Bay Area

Wetland Type	Acres Affected by Core Project Plus Additional Facilities to Serve Alternative Customer Group 1	 Alternative Customer Group 2
Riparian woodlands	1.8	1.7
Riparian scrub shrub communities	0.6	2.2
Riparian herbaceous communities	0	0.1
Seasonal wetlands	0	3.3
Vernal pools	0.03 a/	0.03 a/
Alkali lowlands	14.0	14.0
Coastal brackish marshes	11.3	11.3
Total wetlands	27.7	32.6

---

a/ Rounds to 0.0.

TABLE 5.4.3-1

Acreages of Vegetation Types Crossed by the Proposed Route

Segment and Right-of-Way	Nonnative Grassland	Riparian Wood-land	Foothill Wood-land	Desert Saltbush Scrub	Cheno-pod Scrub	Coastal Marsh	Alkali Lowland	Mojave Creosote Bush Scrub	Mojave Wash Scrub	Agri-cultural Cropland	Orchard	Vine-yard	Fallow Ag. Land	Urban/ Industrial	Disturbed/ Ruderal	Total
CORE PROJECT																
North Mainline																
Construction	481.4	4.7	5.5		30	12	14			452.8	234.8	59.2	0	365.0	287.6	1947
Sacramento Main.																
Construction	32.0	1.8								240.2	14.4	96.6	11.0	71.7	27.2	495
Lindsay Segment																
Construction		2.3								26.0	29.6	2.2		1.1	4.5	66
Coalinga Segment																
Construction	23.0	0.6			10.5	3.9				152.3	16.1	2.8		47.0	20.1	276
Sanger Segment																
Construction										1.4	5.7	30.4		0.8	2.4	41
Livingston Segment																
Construction														0.7		1
Ceres Segment																
Construction										4.5		0.9		2.7		8
Modesto "B" Segment																
Construction											1.9			14.6	0.7	17
Palo Alto Segment																
Construction	135.4	1.2	22.4							17.6	5.3	2.4		153.1	42.2	357
Antioch Segment																
Construction	2.6					0.6								2.9	9.4	15
Fremont Segment																
Construction	2.4													39.7	13.9	56
Compressor Stations																
Amboy								20.6								21
Daggett								17.0								17
Lindsay											17.5					18
Famoso													20.0			20
Looping a/																
Loop 1								141.2								141
Loop 2								341.3	6.6							348
Loop 3				112.7				95.5								208
Loop 4	113.6									64.5	49.1					227

TABLE 5.4.3-1 (cont'd)

Segment and Right-of-Way	Nonnative Grassland	Riparian Wood-land	Foothill Wood-land	Desert Saltbush Scrub	Cheno-pod Scrub	Coastal Marsh	Alkali Lowland	Mojave Creosote Bush Scrub	Mojave Wash Scrub	Agri-cultural Cropland	Orchard	Vine-yard	Fallow Ag. Land	Urban/ Industrial	Disturbed/ Ruderal	Total
ADDITIONAL FACILITIES TO SERVE ALTERNATIVE CUSTOMER GROUP 1																
Famoso Alternative																
Construction	5.3				0.9					92.3	40.9	37.9	37.2	67.0	186.5	468
Kingsburg Segment																
Construction										0.6		0.4		0.4		1
Turlock "A" Segment																
Construction										5.2	1.3	1.0		2.3	1.9	12
Oakland Segment																
Construction	7.5	0.3	12.3							0.7	1.8			70.9	16.2	110
Lathrop Segment																
Construction										6.0	5.9	1.0		13.4	3.5	30
Tracy Segment b/																
Construction										3.6	0.5			14.4	1.5	20
ADDITIONAL FACILITIES TO SERVE ALTERNATIVE CUSTOMER GROUP 2																
Lindsay Alternative																
Construction	35.0	0.9								150.9	133.6	23.2	12.7	17.3	13.6	387
McFarland Segment																
Construction										3.1	22.3	6.4	1.6		0.5	34
Hunters Point Segment																
Construction	0.8	3.9												201.8	29.9	236
San Francisco Segment																
Construction						2.9								2.6		5
Malaga Segment																
Construction														0.4	2.2	3
Madera Segment																
Construction										6.6		10.6		2.2	3.3	23
Fairmead Segment																
Construction	4.4									0.4	7.3				6.2	18
Turlock Segment																
Construction										2.9				7.3	2.2	12
Ripon Segment																
Construction										5.5	1.8					7
Sacramento (A-159) Segment																
Construction	28.4									17.3				13.4		59

TABLE 5.4.3-1 (cont'd)

Segment and Right-of-Way	Nonnative Grassland	Riparian Wood-land	Foothill Wood-land	Desert Saltbush Scrub	Cheno-pod Scrub	Coastal Marsh	Alkali Lowland	Mojave Creosote Bush Scrub	Mojave Wash Scrub	Agri-cultural Cropland	Orchard	Vine-yard	Fallow Ag. Land	Urban/ Industrial	Disturbed/ Ruderal	Total
Tracy (A-160) Segment b/																
Construction										4.7				30.7	4.7	21
Tracy (A-161) Segment																
Construction										4.0			2.9			7
Antioch A-174 Segment																
Construction		0.1												10.0	6.9	18
Martinez Segment (A-172)																
Construction						7.9										8

---

a/ Includes additional temporary right-of-way greater than 75 feet for Loops 1 and 2.

b/ Includes Core Project portion of Tracy Segment.

5.5 WILDLIFE AND AQUATIC RESOURCES

5.5.1 Criteria for Evaluating Impact Determining Significance

Adverse impact on wildlife and fish is considered significant and would require additional mitigation if project construction or operation would:

- Change the diversity or number of a substantial portion of a local population of an animal species or substantially interfere with the survival, growth, or reproduction of affected wildlife and fish populations.
- Substantially interfere with the movement of migratory animals.
- Result in a substantial long-term loss of existing wildlife or aquatic habitat.

Because it is not possible to define "substantial" in a general way, in determining impact significance we relied on agency consultations, literature reviews, discussions with local experts, limited field surveys, and professional judgement. The focus of this effort was on wildlife and aquatic habitats that are especially diverse, regionally uncommon, or of special concern to Federal, state, or other land management agencies or groups. Resources that are considered sensitive are discussed in section 5.6.

5.5.2 General Impact and Mitigation

5.5.2.1 Wildlife

Construction and operation of the project would result in temporary and permanent alteration of wildlife species habitat as well as direct impact on individuals including disturbance, displacement, and mortality. During construction, the more mobile species would be temporarily displaced from the right-of-way and surrounding areas to similar habitats nearby. When displaced, individual species could be lost because of interspecific competition. Some species would return to adjacent, undisturbed habitats soon after completion of construction. Less mobile species such as small mammals, reptiles, and amphibians as well as bird nesting in the right-of-way could be destroyed by construction activities; however, construction is not expected to result in any population-level impact on common species on a regional basis.

Most habitats in the construction right-of-way are either widely distributed in central California such as nonnative grasslands or of a low-quality and created or heavily influenced by human activities such as agricultural croplands and urban areas. The temporary alterations to these areas would not have a significant impact on their wildlife habitat value. Some habitats affected by the project are, however, relatively uncommon and considered sensitive such as foothill woodlands, riparian areas, and vernal pools. Impact on these habitats would vary depending on the duration, successional dynamics of the community, and whether environmental conditions, especially hydrology, are restored after construction. The associated impact on wildlife in these habitats could be significant such as the removal of nest trees or the failure of wetlands restoration. Specific acreages of vegetative communities affected by the proposed route is provided in sections 5.4.2 and 5.4.3. To mitigate wildlife-related impact in these vegetative communities, Mojave would:

- Avoid trees and larger shrubs in desert and foothill woodland communities by minor route realignments.

- Avoid mixed riparian woodlands by either minor realignments or directional drilling at major stream crossings.
- Limit the maintained right-of-way in heavily wooded areas to 10 feet wide.
- Provide compensation funds or acreage for loss of sensitive species habitat such as vernal pools and riparian areas in consultation with appropriate regulatory agencies (see section 5.6).
- Conduct additional mitigation measures outlined in section 5.4.
- In all areas, design and construct project-related powerlines in such a way as to protect birds from electrocution and collision.

5.5.2.2 Aquatic Resources

The greatest potential impact on aquatic resources is sedimentation and turbidity from the use of open-trench construction techniques. Turbidity could increase sedimentation, which could lead to smothering of eggs, degradation of spawning areas, and interference with normal feeding and breeding activities. Spills of fuel, lubricants, or other toxic materials during construction could also adversely affect aquatic organisms by smothering and toxicity. In-stream construction activities, if conducted during spawning season, could also alter or impede spawning migrations. Construction impact could also be caused by streambank excavation activities. Table 4.3.2-1 indicated the construction methods Mojave would use at waterbody crossings. Table 4.5.2-1 listed fisheries present in waterbodies crossed by the proposed route.

Where the pipeline would be constructed across streams by open trenching, Mojave would minimize impact by using the FERC staff's Wetland and Waterbody Construction and Mitigation Procedures (appendix C), in addition to other mitigation measures described in section 5.5.3.

These measures would, in general, mitigate the impact to less than significant levels. Because of the similarity of fisheries mitigation at water crossings, site-specific mitigation is not discussed below.

5.5.3 Site-Specific Impact and Mitigation

5.5.3.1 Mojave Desert

Ruderal Communities

Disturbance to wildlife in ruderal communities would generally be limited to short-term impact, the mortality of lesser mobile species and loss of any nests along the proposed right-of-way, most of which is previously disturbed and minimally vegetated.

Agricultural Communities

There is little cultivated land along the proposed route through the Mojave desert.

Natural Communities — Mojave Desert Scrub

Most of Loops 1 and 2 and all of Loop 3 would be constructed in the previously disturbed rights-of-way of the existing Mojave Mainline and Commonline, constructed in 1991 and 1992. Construction and reclamation associated with the original Mojave pipeline included salvage and replacement of surface soils, recontouring, and imprinting to provide microsites for water retention and seed germination. Observations made during 1994 showed good recolonization of the right-of-way by desert annuals and limited reestablishment of shrubs. Further recovery including greater establishment of shrubs is likely to have occurred by the time construction would begin on Loops 1, 2, and 3. These areas currently have reduced value to wildlife because of their low shrub cover although desert annuals and seeds provide food sources for birds, rodents, and other species. Redisturbance would delay the recovery of this vegetative community.

The impact on Mojave creosote bush scrub and wash scrub would be long-term because recovery of these slow-growing species could take 20 to 50 years or more. Some species such as bursage are better adapted to invade disturbed areas and likely to re-established soon whereas creosote tends to re-establish slowly. Although long-term, the impact on general wildlife would not be significant because of the abundance of these habitats, the relatively small areas affected, and their low productivities. The impact on habitats supporting sensitive species such as the desert tortoise would, however, be considered long-term and significant. Permanent habitat loss would occur at the Amboy and Daggett compressor stations. To mitigate impact on sensitive species habitat, Mojave would provide compensation funds or acreage in consultation with the regulatory agencies (see section 5.6). This measure would reduce the impact to less than significant.

5.5.3.2 Central Valley

The construction and operation of the North Mainline and associated segments in the Central Valley would affect primarily human-created habitats including agricultural croplands, orchards, vineyards, urban/industrial lands, and disturbed/ruderal lands because over 90 percent of the proposed route crosses these areas; natural habitats would, however, be affected along the rest of the route.

Ruderal Communities

These communities include developed lands that have been abandoned as well as undocumented fills, former roads, railroad right-of-ways, and other modified areas. These areas are of low habitat value and do not support important species. Impact on common wildlife would be minor. If any special status species are found to occupy disturbed areas, compensation for loss of habitat would be required (see section 5.6), which would reduce the impact to less than significant. Construction of the pipeline in these habitats would have a very minor effect on wildlife because animals occurring in these habitats are adapted to human presence and activity.

Agricultural Communities

These man-made communities would be the most commonly affected habitat in the Central Valley, but they generally have low wildlife value because of excessive human disturbance. Some raptors use these lands for foraging, preying primarily on small mammals. Other bird species forage on crops and harvest remains. Loss of these lands would not be considered significant from a wildlife perspective because habitat modifications have already rendered them of low value.

Natural Communities

Nonnative Grasslands — Nonnative grasslands would be the most commonly affected natural community in the Central Valley. Pipeline construction would affect a number of small and medium-sized mammalian species, passerine bird species, raptors, reptiles, and amphibians as well as sensitive species such as the San Joaquin kit fox (see section 4.5.2.1). The loss of grassland habitat is expected to be short-term with natural revegetation occurring within one or two growing seasons depending on such factors as precipitation, seed availability, and soil compaction. Recreationally important game species are present in nonnative grassland communities along the proposed North Mainline. Mule deer can be found in Kern County north of MP 0. Black-tailed Deer and pronghorn antelope can be found in San Joaquin County east of MP 234. Tule elk habitat is found between MP 284 and MP 286. The impact would be short-term habitat loss and temporary displacement of individuals from the construction area. To mitigate wildlife-related impact, Mojave would follow the general mitigation measures listed in section 5.5.2.

These measures would mitigate the impact to less than significant levels.

Chenopod Scrub Communities — This community occurs in the most arid portions of the southern Central Valley and consists primarily of valley saltbush scrub. Much of this habitat has been degraded by grazing, resulting in reduced saltbush densities. In the absence of artificial revegetation, natural recovery of this community would be slow and uncertain because of low and erratic precipitation with a mean recovery period of about 20 years. The dominant species can be readily established from seed under appropriate conditions, and thus the impact could be long-term but could be mitigated. Although this community is relatively widespread in the southwestern San Joaquin Valley, it supports a number of endangered, threatened, and sensitive wildlife species as described in section 4.6 and is, therefore, sensitive. To mitigate wildlife-related impact, Mojave would follow the general mitigation measures listed in section 5.5.2.

These measures would mitigate the impact to less than significant levels.

Wetlands — The **riparian woodland, riparian scrub-shrub, and riparian herbaceous communities** are confined to the vicinity of rivers in the Central Valley, river levees, and adjacent agricultural land. These rivers and adjacent woodlands function as important wildlife corridors and as breeding and wintering areas for numerous species. The typical wildlife species associated with riparian lands were described in section 4.5.2.1 and include assorted small and medium-sized rodents, waterfowl, passerine birds, raptors, reptiles, and amphibians. Riparian areas are important habitats for waterfowl, shorebirds, waders, and some raptors. The construction impact would be short-term loss of habitat, mortality of small and less mobile wildlife species, and displacement of other wildlife. The impact could be long-term if drainage patterns were significantly altered. The potential impact on waterfowl would also include temporary displacement during construction because of human activity and equipment noise. Short- or long-term impact could also occur from spills of hazardous materials into wetlands. Loss of trees and larger shrubs in the construction right-of-way could result in a direct impact on wildlife including nesting passerines and raptors. The loss of riparian woodland would be considered significant but could be mitigated. Mojave would follow the general mitigation measures discussed in 5.4.2 to mitigate wildlife-related impact in riparian woodlands.

Because of the high habitat value of the riparian woodland communities and the long-term impact associated with maintaining a 10-foot-wide right-of-way in wooded riparian areas, we recommended in section 5.4 that Mojave use the Project Revegetation Requirements (appendix B) that include the replacement of woody riparian plants onsite at a ratio of 3:1. Additional mitigation for woody riparian vegetation could be required in the form of offsite compensation depending on an evaluation of habitat values that are lost.

The wildlife associated with **seasonal wetlands** is supported by both the dryer upland habitats and the wetter riparian zones. Assuming proper restoration of the right-of-way, impact on this wildlife would be short-term and minor. Limited mortality would occur to less mobile species. Mitigation for these seasonal wetland areas was discussed in section 5.4.2.

Vernal pools are associated with nonnative grasslands in several locations along the proposed route. Amphibians and sensitive crustaceans such as vernal pool fairy shrimp are associated with these pools. Construction through a vernal pool could destroy the hardpan underneath and permanently modify the hydrology unless the soil layers are carefully restored. Because of the rarity of these pools, their sensitivity to disturbance, and the presence of sensitive species, the impact would be significant and long-term. Mojave has proposed avoiding all vernal pools; however, because the final project engineering design has not been completed, the possibility exists that not all pools could be avoided. Mitigation was discussed in section 5.4.2.

Nonnatural ponding areas are similar to vernal pools in their use by wildlife. Impact due to construction would only be significant if preconstruction surveys identify sensitive species. Mitigation in these specific areas was discussed in section 5.4.2. These mitigation measures would reduce the wetland-related impact to less than significant.

5.5.3.3 Coast Ranges - San Francisco Bay Area

Ruderal Communities

Impact on wildlife in ruderal communities and associated mitigation measures were discussed in section 5.5.3.2.

Agricultural Communities

These man-made communities generally have low wildlife value because of excessive human disturbance. Loss of these lands would not be considered significant from a wildlife perspective because habitat modifications have already rendered them of low value.

Natural Communities

Nonnative Grasslands — Impact on wildlife in nonnative grasslands and associated mitigation measures were discussed in section 5.5.3.2.

Foothill Woodlands — The wildlife communities associated with oak woodland habitats are relatively diverse with a full assemblage of vertebrate species. Many areas of oak woodland in California have been lost or modified by past human activities, and the remaining habitat is considered of high value. Impact would vary depending on the density of trees and shrubs. In oak savannas, the widely spaced trees would be relatively easy to avoid during final pipeline alignment and construction, and few trees would be lost. The direct impact should be short-term, mostly confined to the nonnative grassland component of the savanna. In denser stands, pipeline construction would require removal of trees and shrubs, and the impact would be long-term. Loss of trees could result in a direct impact on typical wildlife species including nesting passerines and raptors. To mitigate wildlife-related impact, Mojave would make minor realignments of the pipeline in oak woodlands with widely spaced trees and conduct preconstruction surveys to determine the presence of nesting raptors. If nesting raptors are present within 0.5 mile of the proposed route, Mojave would avoid construction activities between April 1 and August 15. Because of the scarcity of foothill woodland communities in California and the valuable habitat they provide for raptors and other wildlife, we recommended in section 5.4.3 that Mojave replant trees and larger shrubs according to the Project Revegetation Requirements (appendix B) where realignment or narrowing of the right-of-way would not be feasible and avoid specimen oak trees greater than 12 inches in diameter. Recreationally important game species also occur in foothill woodlands. Black-tailed deer occur in agricultural areas and oak woodlands along the Palo Alto Segment. Black-tailed deer also occur in both natural and human-influenced communities along the Oakland Segment. The impact on game species would be short-term habitat loss and temporary displacement of individuals from the construction area. The mitigation measures described above would reduce the impact on associated raptors and other wildlife species to less than significant levels.

Wetlands — Construction impact on wildlife in **riparian woodland, riparian scrub-shrub, and riparian herbaceous communities** and associated mitigation measures were discussed in section 5.4.2. There are no nonnatural ponding areas within the Coast Ranges. In addition, as part of the mitigation required for a flood control project, the Santa Clara Valley Water District is overseeing ongoing revegetation and restoration along the west side of the Coyote Creek riparian corridor and south of Highway 237 where the proposed Palo Alto Segment would cross the creek. This riparian corridor (MP 30 to MP 32.5) is also a primary stopover for neotropical migrant passerines from August through October and contains a salt marsh harvest mouse restoration pond. To minimize construction-related impact on this area:

◆ **We recommend narrowing the right-of-way to stay within the levee area along the west side of the riparian corridor to reduce the impact on the revegetation project; we also recommend that Mojave coordinate with the City of San Jose and the Santa Clara Valley Water District during construction within the Coyote Creek riparian corridor.** 1/

Alkali lowlands within the North Mainline construction right-of-way occur where there is periodic ponding of water and the soils are heavy and saline and/or alkaline. Construction could alter drainage and water retention by mixing soil horizons, resulting in invasion by upland plant species. This impact would be short-term because species characteristic of this community should revegetate the right-of-way. Specific mitigation measures for alkali lowlands were presented in section 5.4.2.

Construction could impact **coastal brackish marshes**, which support diverse wildlife as discussed in section 4.5.3.1. Impact on wildlife would generally be short-term, resulting primarily from direct mortality to lesser mobile species and destruction of any nests in the right-of-way. Spills or the introduction of contaminants could also create short- to long-term impact on these communities. A potential long-term impact could result if invasive species re-establish in the right-of-way and preclude the re-establishment of wildlife species that are specific to the pre-existing vegetation. Mitigation measures for coastal brackish marsh communities were discussed in section 5.4.2. These mitigation measures will reduce wetland-related impact to less than significant.

1/ The FERC and SLC staffs will recommend to their respective Commissions that their additional mitigation measures (offset type in the text) be included as specific conditions to any approving Certificate issued for Mojave's project. The staffs will also recommend that Mojave be required to implement the mitigation measures that Mojave has proposed as part of the project unless specifically modified by other Certificate conditions.

5.6 SPECIAL STATUS SPECIES

5.6.1 Criteria for Evaluating Impact and Determining Significance

Adverse impact on Federal- or state-listed, candidate, or BLM-designated sensitive species is considered significant and would require additional mitigation if project construction or operation would result in:

- Direct mortality of an individual of a listed species.
- Loss of existing or proposed critical habitat.
- Temporary alteration or loss of habitat that could result in avoidance by a listed species or that could cause increased mortality or lowered reproductive success.

5.6.2 General Impact and Mitigation

The general impact on threatened and endangered species would be the same as described in section 5.4 for vegetation and section 5.5 for wildlife and aquatic resources. Sensitive plant species in the proposed pipeline right-of-way would be lost when the right-of-way is cleared, and sensitive animal species could be affected by the temporary loss of habitat during construction. Mobile individuals would likely be displaced to other habitats but could be lost because of intraspecific competition, predation or other stresses. Immobile species and juveniles could be destroyed. Permanent loss of habitat would occur at the new compressor stations. Long-term impact could occur outside the previously disturbed right-of-way in the Mojave Desert where the recovery of sensitive plant species could take 20 to 50 years. Sensitive species could also be affected where blasting is required.

In addition to the proposed general mitigation measures listed in appendices A, B, and C, Mojave would implement the following measures to mitigate impact on special status terrestrial species:

- Perform preconstruction surveys to identify occupied habitats in order to make minor realignments that would avoid damage to species and to provide a baseline against which to measure actual project impact. The surveys would be conducted within the timeframes specified by the FWS or DFG and would clearly mark burrows, nests, plant locations, and sensitive species habitat within and adjacent to the construction zone.
- Conduct a worker education program to instruct all construction and operation personnel on basic sensitive species identification and mitigation measures. Specific information about sensitive species, their habitats, and sensitivities will be included in the program for all personnel who could encounter the species. Additionally, workers would be instructed on the penalties for noncompliance with the mitigation plan or violation of the endangered species acts.
- Inspect each blasting zone immediately before blasting to identify active burrows and remove any individuals of sensitive animal species that are seen on the ground surface. After blasting, active burrow entrances would be checked to ensure that they are open, and, if necessary, active burrows that were plugged or collapsed by the blast would be excavated and any trapped animals would be released.

- Report any accidental death or injury of a listed animal species to the DFG and FWS immediately and follow the DFG's and FWS's handling instructions.
- Restore the right-of-way through natural habitats and monitor natural and artificial revegetation until the success criteria are met.
- Compensate for permanent or long-term loss of habitat with funds or acreage on the basis of the species and acreages affected.
- Not use herbicides or rodenticides in construction areas except at permanent aboveground facilities.

Because Mojave did not have access to all areas potentially affected by the project and was not able to complete the necessary surveys.

◆ **We recommend that Mojave conduct additional or new surveys where necessary, including those segments of the proposed route that were previously inaccessible (see table 5.6.2-1), for the federally or state listed or proposed endangered and threatened species. Surveys should also include plant species in the California Native Plant Society Lists 1 through 4 and species of special concern. Before the initiation of surveys, Mojave should consult with the FWS and DFG for appropriate species lists, survey methods and periods for each species. The survey reports and any FWS and DFG comments on the survey and its conclusions shall be filed with the FERC and SLC. The survey reports should include the following information:**

- **name(s) and qualifications of the person(s) conducting the survey;**
- **method(s) used to conduct the survey;**
- **date(s) of the survey; and**
- **area surveyed (include the mileposts surveyed).**

For species identified during preconstruction surveys and in those areas previously inaccessible, Mojave should propose mitigation that would substantially minimize or avoid potential impacts. Where ever possible, avoidance by narrowing the right-of-way, route realignment, or special construction techniques should be the preferred mitigation. If avoidance is not feasible, off-site compensation may be required to mitigate the impact to less than significant. Mojave must receive written approval from the FERC and SLC before implementing mitigation for these sensitive species.

◆ **In addition, we recommend that Mojave not begin construction activities until:**

- **The FERC and SLC receive comments from the FWS and DFG regarding the proposed action.**
- **The FERC and SLC complete formal consultation with the FWS and DFG.**
- **Mojave has received written notification from the Director of the Office of Pipeline Regulation that construction or mitigation may begin.**

The Director of the Office of Pipeline Regulation has delegation authority to modify the conditions that apply to the 30 federally listed or proposed endangered or threatened species addressed herein

TABLE 5.6.2-1

Portions of the Proposed Route Requiring Field Surveys for Special Status Species

Pipeline Segment	Beginning Milepost	Ending Milepost	Habitat Type
North Mainline	16.0	16.4	Nonnative grassland
	22.5	24.2	Vineyard, disturbed
	129.3/137.8	129.5/138.0	Vineyard
	203.5/211.7	203.9/212.1	Orchard
	221.8/230.5	221.9/230.6	Agricultural cropland
	224.1/232.8	224.6/233.3	Agricultural
	236.2/244.9	247.1/255.8	Disturbed
	347.4/256.1	250.4/259.1	Alkali lowland
	250.9/259.6	264.1/263.8	Nonnative grassland
	258.7/267.4	260.6/269.3	Nonnative grassland, alkali lowland
	264.6/273.3	268.8/277.5	Nonnative grassland, riparian woodland
	269.9/278.6	272.2/280.9	Nonnative grassland
	273.0/281.7	274.7/283.3	Nonnative grassland
Sacramento Mainline	31.4	31.5	Urban
	37.5	39.7	Agricultural, riparian
	44.9	45.3	Agricultural, urban
Palo Alto Segment	1.5	14.2	Agricultural, nonnative grassland, urban, foothill woodland
	14.7	15.5	Nonnative grassland
	16.2	23.6	Nonnative grassland, foothill woodland
Oakland Segment	5.5	5.7	Disturbed
Malaga Segment	0.0	0.7	Agricultural, industrial
Madera Segment	2.0	3.9	Agricultural
Hunters Point Segment	27.7	30.1	Urban
Sacramento Segment (A-159)	3.2	4.3	Nonnative grassland
	5.0	5.5	Agricultural
Tracy Segment	0.0	1.0	Agricultural
Fairmead Segment	3.3	5.0	Disturbed

Total miles requiring field surveys equals 75.3, which corresponds to about 619 acres of construction right-of-way.

as a result of the FWS consultation. These measures would, in general, reduce the impact to less than significant levels.

Requirements of the Federal and California Endangered Species Acts

Under Section 7 of the ESA, the FERC must consult with the FWS to determine whether any Federally listed or proposed species or their designated or proposed critical habitats occur in the vicinity of a proposed project under the FERC's jurisdiction. We have consulted informally with the FWS and are currently reviewing Mojave's biological survey report, which identifies the potential and occupied habitats of such species in the proposed project area. At the conclusion of our review, we will: make a determination of the proposed project's effects on threatened and endangered species and their habitats; recommend mitigation measures to avoid or minimize those effects; discuss any alternatives to the proposed project; and document all of these findings by preparing a Biological Assessment (BA) as required by the ESA.

Because the proposed project would affect listed species and critical habitats, we will then formally consult with the FWS in order to obtain a Biological Opinion from the FWS before making any irreversible commitment on the project. The FWS's Biological Opinion will: provide a detailed analysis of the effects of the proposed project on threatened and endangered species; identify alternatives, if necessary, as well as specific mitigation measures; specify the allowable incidental take of listed species; and present the FWS's opinion on whether the project would likely jeopardize the continued existence of any listed species. If the FWS issues a jeopardy opinion, further discussion would occur between the FERC and FWS until the FERC issues a written notice of its decision to proceed with, modify, or forego the proposed project.

As required by CESA, the SLC has consulted informally with the DFG to determine the proposed project's impact on state-listed or proposed species. On the basis of these consultations, a review of Mojave's biological survey report, and the information contained in this EIR, the DFG will issue its Biological Opinion indicating the specific mitigation measures and conditions of incidental take.

Additional requirements or information developed during the consultation process with the FWS and DFG will be included in the Final EIR/EIS. To ensure that the mitigation measures required by the FWS and DFG as documented in the Biological Opinions are included in the project, the FERC and SLC would monitor the construction. Mojave's biological survey report, the BA, and the Biological Opinions, when issued, may be reviewed at the FERC, SLC, BLM, FWS, and DFG offices listed in appendix G.

5.6.3 Site-Specific Impact and Mitigation

Mojave conducted biological resource surveys during 1993 and 1994 to collect information on threatened and endangered as well as other sensitive species of concern. Of the 92 species targeted in the field surveys, 35 were found in or near the proposed pipeline right-of-way and could be affected by the project (see table 4.6-2). The general locations of these species and their potential habitat are shown on the maps in volume II, but the specific locations of the species observed during the field surveys have been omitted in order to prevent unauthorized collection and habitat degradation. The proposed project would have no effect on the remaining 57 species or habitat targeted in the field surveys because they are not expected to occur within the project area or would not be affected by the project.

On the basis of informal conferences to date, the FERC, SLC, BLM, FWS, and DFG have proposed measures to mitigate the project's potential impact on the 35 species found in or near the proposed right-of-way. The impact could be short- or long-term and, depending on the species, could include construction-induced reproductive failure, construction-related mortality, and temporary, long-term, or permanent loss of habitat. Permanent loss of habitat would only occur at the aboveground facilities. Table 5.6.3-1 at the end of section 5.6 summarizes the impact and proposed mitigation for each of the 35 species. Mitigation measures are provided for Federal- and state-listed and proposed species as well as California species of special concern.

Where mitigation would not reduce to impact to less than significant, Mojave would be required to provide compensation funds or acreage. For example, for sensitive animal species such as the desert tortoise, construction-related mortality and long-term loss of habitat would remain a significant impact and require compensation. Sensitive plant species known to occur in or adjacent to the right-of-way such as Hoover's wooly-star and Bakersfield cactus could be destroyed if pipeline realignment is not feasible, and the conditions for incidental take of these species will be prescribed in the Biological Opinions. The following sections provide a more detailed discussion of impact and mitigation (including compensation where necessary) for species within each physiographic province. Table 5.6.3-2 at the end of section 5.6 summarizes the acres affected for each of the 35 species. Acreages are identified as either potential habitat, potential unsurveyed habitat and occupied habitat. This information may be used as a basis for calculating compensation land requirements as necessary. A final determination on the amount of compensation lands required will be based on post-construction measurements.

5.6.3.1 Mojave Desert

Mojave Ground Squirrel

All construction along Loop 3 would occur within the previously disturbed right-of-way for the original Mojave pipeline. If limited recolonization has occurred, reclearing the construction right-of-way could destroy Mojave ground squirrel burrows and cause injury or mortality to individual squirrels that are trapped or crushed in their burrows.

Direct impact on Mojave ground squirrel would be largely mitigated by avoiding their burrows by restricting of the construction right-of-way around active burrows. If it is impossible to avoid an active burrow within the construction right-of-way, the individual squirrels would be removed and the burrow closed to prevent their re-entry. In addition to the general mitigation measures listed in section 5.6.2, the following measures would be taken to identify active burrows and minimize construction-related impact on the Mojave ground squirrel:

- The preconstruction surveys would be conducted between MP 1.9 and MP 22.9 on Loop 3 simultaneously with preconstruction surveys for desert tortoise.

- Flagged exclusion zones would be established around all active Mojave ground squirrel burrows that could be adversely affected by construction activities. Construction activities, especially vehicle activity and equipment storage would be prohibited or minimized, would be within the exclusion zones.

- Any known Mojave ground squirrel burrows within the construction right-of-way that could not be avoided would be carefully destroyed following DFG guidelines using hand tools until it is certain that the burrow is inactive.

Offsite compensation for Mojave ground squirrel will be included as part of Desert tortoise compensation for habitat loss within the previously disturbed areas of Loop 3.

Burrowing Owl

Project activities could result in the loss of burrows and mortality of individual owls. Trench excavation, construction, and vehicular traffic during the nesting season from approximately February to August could result in the destruction of nestlings or adults within burrows or in nest abandonment and reproductive failure.

If burrows are identified within the construction right-of-way during the preconstruction surveys would be monitored for signs of nesting activity. Where possible, occupied burrows would be avoided by minor route realignment. If realignment is impossible, the following mitigation measures would be implemented to reduce the potential for direct mortality of burrowing owls in addition to the general mitigation measures listed in section 5.6.2:

- Before the breeding season, owls living within the right-of-way would be removed by placing a one-way door on the burrow entrance. Once the burrow has been abandoned, it would be permanently closed.
- Exclusion zones would be established around burrows within or immediately adjacent to the construction right-of-way if owls are not removed before the nesting season. Construction activities within the exclusion zones would be prohibited until after the nestlings have fledged.
- The construction right-of-way would be monitored to determine whether any burrows have been constructed or re-inhabited between the preconstruction surveys and the clearing of the construction right-of-way.

Desert Tortoise

The desert tortoise would be susceptible to injury or mortality from crushing during the initial clearing of the construction right-of-way. Tortoises in burrows could be crushed or trapped if the burrows collapse under the weight of construction equipment. Active tortoises might not be able to escape fast-moving machinery within the construction zone or could fall into open trenches and become trapped. These tortoises could be exposed to extreme temperatures if they are removed during the heat of the day in the summer or during early morning low temperatures in the winter and spring.

Clearing and compacting the construction right-of-way would result in the long-term loss of desert tortoise habitat; however, most of the construction right-of-way for the loops would be within the previously disturbed construction right-of-way for the existing Mojave pipeline. Construction of Loops 1 and 2 would require an additional 144.48 acres of previously undisturbed Mojave desert scrub habitat of which 20.61 acres are considered BLM Category 1 desert tortoise habitat, 62.13 acres are considered BLM Category 3 habitat, and 61.75 acres are not considered desert tortoise habitat. No additional right-of-way would need to be cleared for Loop 3 because the construction right-of-way for the existing pipeline was 100 feet wide. Construction of the Amboy and Daggett Compressor Stations would result in the permanent loss of 37 acres of BLM Category 3 habitat, 20 acres at Amboy and 17 acres at Daggett. Affected desert tortoise habitat is summarized in table 5.6.3.1-1.

Onsite mitigation measures would be implemented to minimize the level of take that might result from construction activities within the entire 75-foot-wide construction right-of-way along the loops in the Mojave Desert, including the portion of the right-of-way disturbed by construction of the

TABLE 5.6.3.1-1

Detailed Breakdown of Desert Tortoise Occupied Habitat

Right-of-Way Status	Occupied Habitat by BLM Category (acres) a/		
	Category 1	Category 3	Total
Previously disturbed	194.03	213.02	407.05
Previously undisturbed	20.61	99.16 b/	119.77
Total	214.64	312.18	526.82

a/ Assumes Kern River expands coincidentally.

b/ Includes 37 acres for the Amboy and Daggett Compressor Stations.

original Mojave pipeline and the additional right-of-way disturbed by the new construction. In addition to the general mitigation measures listed in section 5.6.2, the onsite mitigation measures would include:

- During the preconstruction surveys in all areas of known and potential desert tortoise habitat within and adjacent to the construction zone, tortoise burrows would be identified and clearly marked to prevent crushing and take.
- Each tortoise burrow in or near the construction right-of-way that could be avoided by construction activities would be protected by flagging stretched between stakes, at least 20 feet from the burrow on sides bordered by construction activities. No construction activities would occur within these exclusion zones, which would be clearly labeled with signs identifying the purpose and restrictions on access.
- Tortoise burrows that could not be avoided would be excavated by hand down to the tortoises, which would be removed. Burrows would be excavated by or under the supervision of qualified tortoise biologists.
- Tortoises removed from burrows or found aboveground would be relocated at least 150 feet from the construction right-of-way but within 300 feet of the point of capture. Tortoises would only be handled by qualified biologists according to protocols agreed upon by the FWS and DFG. Biological monitors along the loops would be specially trained in surveying and handling procedures for desert tortoise. These procedures would vary according to the season in which construction occurs. Artificial hibernacula could be required in the winter, and rehydration could be required in the summer.

◆ **Additionally, we recommend that open trenches be inspected three times a day as well as immediately before backfilling, that stockpile areas be fenced, and that burrows within the right-of-way be inspected using a fiber-optic scope.**

Compensation for loss of habitat would follow BLM and DFG guidelines for projects affecting less than 1,000 acres as calculated in appendix D. To compensate for long-term loss of habitat in areas outside of the previously disturbed right-of-way, Mojave has proposed a compensation of 4.0:1. This ratio is based on factors including the category of BLM habitat, impact on adjacent lands, growth inducements as a result of the development, existing disturbance and duration of effect. Mojave has not proposed any off-site compensation for loss of desert tortoise habitat in areas previously disturbed by the construction right-of-way for the original project. Because redisturbance will delay substantial recovery of these areas by approximately four years and the time needed for substantial recovery is estimated to be 25 years,

◆ **We recommend that Mojave provide off-site compensation for the previously disturbed rights-of-way for Loops 1, 2, and 3. The compensation ratio derived for BLM Category 1 and 3 lands should be decreased by a factor of 4/25s, or 0.16, and applied only to those areas previously disturbed.**

For Loops 1 and 2, this adjusted compensation ratio would be applied to 56.67 acres of BLM Category 1 habitat and 142.20 acres of Category 3 habitat. For Loop 3, the adjusted ratio would be applied to 137.36 acres of Category 1 habitat and 70.82 acres of Category 3 habitat.

Foxtail Cactus

An additional 40 feet width of construction right-of-way would be cleared for the construction of Loop 2 in the vicinity of a population of foxtail cactus. Clearing additional right-of-way in previously undisturbed habitat has the potential to disturb or destroy additional members of the population. Each individual cactus that could not be protected by restricting the right-of-way would be transplanted using the technique applied by environmental monitors for the original Mojave pipeline. This technique calls for excavation of the entire plant, trimming the roots to stimulate production of new root tips, and replanting in the northwestern shade of creosote bush with the same orientation the cactus had prior to removal. This technique should reduce the impact on foxtail cactus to less than significant.

Mojave Eriophyllum

Impact on Mojave eriophyllum would only occur if the Kern River were to proceed with its expansion, which would be constructed entirely within the 100-foot-wide corridor cleared for the original Mojave pipeline. Because no additional construction right-of-way in previously undisturbed habitat would be required for Loop 3, impact should be limited to those plants that have recolonized the original Mojave pipeline construction right-of-way. Mitigation would be as described for the special status plant species in the Central Valley (see section 5.6.3.2).

5.6.3.2 Central Valley

San Joaquin Kit Fox

Project activities could result in the temporary loss of kit fox habitat, the disturbance or mortality of individual kit foxes, the destruction of potential and active dens, and a temporary decline in prey species. Trench excavation and right-of-way clearing could potentially cause direct kit fox mortality by destroying occupied dens or could decrease reproductive success by eliminating natal dens during nonbreeding periods. Vehicular traffic could also result in direct mortality. Kit foxes could be attracted to stored pipe and construction equipment, further increasing the potential for construction-related impact.

The potential for construction-related mortality would also depend on the quality of habitat adjacent to the construction right-of-way and the density of kit fox in the area.

Approximately 39.93 acres of good-quality San Joaquin kit fox habitat within chenopod scrub communities would be temporarily lost if either additional Customer Group 1 or 2 were served. The temporary loss of approximately 123.15 acres of good-quality habitat in nonnative grassland communities would also occur if Customer Group 1 were served whereas approximately 154.52 acres would be temporarily lost if Customer Group 2 were served.

Poor-quality habitat is defined as agricultural, urban, and disturbed lands within the occupied range of the San Joaquin kit fox in the southern San Joaquin Valley. Approximately 1,027 acres of this type of habitat would occur within the proposed construction right-of-way if additional Customer Group 1 were served, whereas approximately 988 acres would occur within the proposed construction right-of-way if additional Customer Group 2 were served.

Although a portion of the construction right-of-way would be designated permanent right-of-way, no permanent facilities or access roads would be maintained, and the land would be restored to its original condition after construction. The only permanent loss of kit fox habitat would occur at the aboveground facilities, i.e., the Lindsay or Famoso Compressor Station and meter stations. Construction of the Lindsay or Famoso Compressor Station would result in the permanent loss of 17.28 or 20.0 acres of good-quality habitat, respectively.

Direct mortality as a result of entrapment of kit foxes in dens or excavations would be minimized by avoiding known dens wherever possible. Where avoidance is not possible, hand excavation of known and potential dens within the construction right-of-way would be conducted following consultation with the FWS and DFG using techniques approved by those agencies as stated in "Standardized Recommendations for Protection of the San Joaquin Kit Fox" (FWS, 1989). In addition to the general mitigation measures listed in section 5.6.2, the following specific mitigation measures are proposed to minimize impact on San Joaquin kit fox:

- The preconstruction surveys in areas identified as supporting good-, moderate-, or poor-quality San Joaquin kit fox habitat would be constructed within 30 days before starting construction activities to determine current kit fox occurrences along the proposed construction right-of-way. The results of these surveys would be presented to the FWS within two weeks of their completion.
- Following the preconstruction surveys but prior to construction, circular exclusion zones would be established around all known and potential dens, and construction activities, especially vehicle activity and equipment storage, would be prohibited or minimized within exclusion zones.
- Any known or potential kit fox dens within the construction right-of-way that could not be avoided would be carefully destroyed following FWS protocol using hand tools until it is certain that the den is inactive.

Temporary loss of kit fox habitat during construction would be mitigated by revegetating the construction right-of-way and providing compensatory acreage as calculated in appendix D. Using this formula the habitat compensation ratio for chenopod scrub habitat is 1.08:1, and the ratio for nonnative grassland habitat is 0.3:1. Based on these calculations, the temporary loss of 39.3 acres of good-quality chenopod scrub habitat would be compensated by acquiring 43.12 acres of existing high-quality habitat if either Additional Customer Group 1 or 2 were served. Compensation of habitat loss in nonnative grassland would require the permanent protection of 36.95 or 46.35 acres if Additional Customer Group 1 or 2 were served, respectively. No habitat compensation acreage would be provided for the temporary loss of marginal-quality kit fox habitat in agricultural, urban, and disturbed lands unless evidence of an active den is found within or adjacent to the construction right-of-way. If an active den is discovered during the preconstruction surveys, the resource agencies would be notified, and appropriate compensation acreage would be determined.

Tipton Kangaroo Rat and Short-Nosed Kangaroo Rat

Construction activities on the North Mainline could result in the temporary loss of Tipton kangaroo rat habitat if Additional Customer Group 1 is served and the disturbance or mortality of individual kangaroo rats. Project construction could result in the temporary loss of disturbed Short-Nosed kangaroo rat habitat near the west end of the Coalinga Segment. Trench excavation and right-of-way clearing could potentially cause direct mortality by destroying occupied burrows or could decrease reproductive success if conducted during the breeding period. Vehicular traffic could also result in direct mortality, and Kangaroo rats could be attracted to stored pipe and construction equipment and food-related trash, further increasing the potential for construction-related impact. Construction will not result in the permanent loss of Tipton or Short-Nosed kangaroo rat habitat because no permanent facilities are proposed within occupied kangaroo rat habitat. Construction would result in the temporary loss of 2.7 acres of habitat.

Direct mortality of Tipton kangaroo rat and short-nosed kangaroo rat during construction would be minimized by restricting the width of the construction right-of-way and establishing exclusion zones around known burrows. Trapping and relocation of individual kangaroo rats would not be performed at the known site because it is assumed that kangaroo rats displaced by construction would move into natural habitat adjacent to the construction right-of-way. In addition to the general mitigation measures listed in section 5.6.2, the following mitigation measures are proposed to minimize potential impact to Tipton kangaroo rat and short-nosed kangaroo rat:

- The preconstruction surveys would be conducted within 30 days before starting construction activities in order to update the status of the Tipton and short-nosed kangaroo rats within the construction right-of-way. The surveys for the Tipton kangaroo rat would be conducted between Pixley and Tulare on the North Mainline simultaneously with the preconstruction surveys for San Joaquin kit fox. Surveys for Short-nosed kangaroo rat will be conducted along the last 5 miles on the Coalinga segment.

- Following the preconstruction surveys but before construction, circular exclusion zones would be established around all known Tipton and Short-Nosed kangaroo rat burrows and prohibited or minimized construction activities, especially vehicle activity and equipment storage, would be within the exclusion zones.

- Any known Tipton and Short-Nosed kangaroo rat burrows within the construction right-of-way that could not be avoided would be carefully destroyed following FWS guidelines using hand tools until certain that the burrow is inactive.

- All pipes, culverts, and similar structures would be inspected before burying, capping, or otherwise installing in the trench.

Swainson's Hawk

Construction-related impact such as increased noise and vehicular activity could temporarily jeopardize the reproductive success of nesting Swainson's hawks. DFG policy generally prohibits construction activities within 0.5 mile of an active nest; however, recent observations indicate that many Swainson's hawk nests are adjacent to heavily used transportation corridors. It appears that these birds are less sensitive to noise and vehicular activity than those nesting in more remote areas. Impact on Swainson's hawk from construction-related activities could, therefore, vary considerably depending on the location of the nest and the surrounding land uses in relation to the proposed construction right-of-way. The proposed project is not expected to cause permanent loss of nesting habitat because any nest trees would be avoided by minor route realignments.

Mitigation measures for nesting Swainson's hawks would primarily focus on the prevention of nest abandonment during project construction. These measures would be implemented when pipeline construction would occur within potential Swainson's hawk nesting habitat during the nesting season from March through July. No mitigation of construction-related impact is necessary if construction occurs between August and February. In addition to the general mitigation measures listed in section

5.6.2, the following specific mitigation measures are proposed to minimize construction-related impact on Swainson's Hawk:

- The preconstruction surveys of potential Swainson's hawk nesting habitat would be conducted in March at the beginning of the nesting season and again 30 days before construction to identify active nests within 0.5 mile of the construction right-of-way. These survey results would be provided to the DFG for evaluation of each nest site.

- Following the preconstruction surveys but before construction, exclusion zones would be established around all known Swainson's hawk nest sites. The radius of the exclusion zone would be determined by consultation with the DFG who will review each nest site on a case by case basis. Construction-related activities, especially vehicle activity and equipment storage, would be prohibited within the exclusion zones until the nestlings have fledged.

- All nests within 0.5 mile of the construction right-of-way would be monitored throughout the construction period or the nesting season, whichever ends first. Nesting birds would be monitored for indications of distress or harassment caused by construction activities. The DFG would be notified if behavioral changes are observed.

♦ **Additionally, we recommend avoiding the removal of nest trees within the construction right-of-way. If nest tree removal is unavoidable, replacement should be discussed on a case-by-case basis with the DFG. We also recommend that observance of the nesting season be extended to August 15 or until all fledglings have left the nest.**

Blunt-Nosed Leopard Lizard

The potential impact on blunt-nosed leopard lizard is similar to that described above for San Joaquin kit fox. Direct mortality of blunt-nosed leopard lizards could occur during pipeline construction because of entrapment in burrows during construction, entrapment and subsequent burial in the pipeline trench, or impact with construction vehicles. Construction activities could cause reproductive failure if they occur during the breeding season. Pipeline construction could result in the temporary loss of 39.93 acres of blunt-nosed leopard lizard habitat. No permanent loss of habitat would result because there would be no permanent aboveground facilities in identified leopard lizard habitat.

Direct mortality of blunt-nosed leopard lizard as a result of construction-related activities would be minimized by avoiding known burrows by minor route realignment or restricting the width of the construction right-of-way where possible. When avoidance is not possible, construction-related impact would be mitigated by applying the following measures in addition to the general mitigation measures listed in section 5.6.2:

- The preconstruction surveys of blunt-nosed leopard lizard habitat would be conducted within 30 days before startup construction activities. Occupied habitat would be marked on the alignment sheets.

- Following the preconstruction surveys but before construction, circular exclusion zones would be established around all known leopard lizard burrows, and prohibited or minimized construction, especially vehicle activity and equipment storage, would be within the exclusion zones.

- Any known leopard lizard burrows within the construction right-of-way that could not be avoided would be carefully excavated following FWS protocol using hand tools until certain that the dens are inactive or the lizards escape.
- Open trenches in blunt-nosed leopard habitat would be inspected at least twice a day and immediately before backfilling. Lizards in trenches would be removed by the environmental monitors.
- The right-of-way would be inspected immediately before ground-disturbing activities for active blunt-nosed leopard lizard.
- If blunt-nosed leopard lizards are observed in the right-of-way, they would be removed from the area before resuming construction-related activities.

Mojave has proposed that construction in blunt-nosed leopard lizard habitat not be limited to either inactive or active periods; however, the protocols for construction monitoring would differ slightly for active and inactive periods. If construction occurs during active periods, i.e., when temperatures are between 75 to 95°F, the open trench would be inspected more frequently by the monitors. If construction occurs during inactive periods, i.e., when temperatures are below 75°F or above 95°F, increased emphasis would be placed on locating and avoiding or excavating known burrows. Because of pit-fall risks that could occur when this species is active (November 1 - April 1):

- **We recommend that construction in occupied habitat occur during the dormant period from November 1 to April 1 wherever possible.**

The blunt-nosed leopard lizard habitat identified during the field surveys is entirely encompassed within good-quality San Joaquin kit fox habitat; therefore, temporary loss of blunt-nosed leopard lizard habitat would be mitigated simultaneously by providing habitat compensation acreage for San Joaquin kit fox.

Giant Garter Snake

Clearing and trenching activities within potential giant garter snake habitat could injure or kill adult giant garter snakes and disrupt breeding activities. The highest potential for take would occur during the winter months when adult snakes are hibernating in upland hibernacula. Potential impact would be less likely to occur from May to October when giant garter snake is active. If suitable wetland habitat is available adjacent to the construction right-of-way, giant garter snake could be expected to move out of the area while construction activity is occurring. If the stream or canal is dry during the active period, it could be assumed that giant garter snake is not present. Giant garter snake would also not likely be present in fast-moving rivers that support permanent warmwater fisheries.

Temporary loss of habitat would occur during construction and until emergent vegetation is restored within the cleared right-of-way. Hibernacula consisting of burrows or excavations in upland areas adjacent to wetlands could be destroyed by trenching and clearing activities.

Measures would be taken to minimize potential impact on giant garter snake where its presence is likely on the basis of the presence of suitable habitat within its known range. Areas with a high likelihood of supporting giant garter snake and the condition of potential habitat along intermittent streams and canals would be determined through consultation with the resource agencies just prior to construction so that appropriate mitigation measures could be taken. In addition to the general mitigation measures listed in section 5.6.2 and the measures taken to reduce construction-related impact on wetland habitats (see section 5.5), the following mitigation measures are proposed:

- When possible, construction within occupied giant garter snake habitat would be avoided during the dormant season from October through March. Construction in April through September would be coordinated with the resource agencies.
- Stream and canal banks should be reconstructed in a manner that provides hibernacula for giant garter snake if approved by the party responsible for levy or bank management. Chunks of concrete rip-rap or other suitable material would be semiburied above the 100-year flood level.
- The construction right-of-way width would be restricted as much as possible within the riparian zone and wetland habitat.
- Excavation spoils would be placed in a designated area that is unlikely to be used by giant garter snake and would be replaced immediately or removed after construction is completed.
- If possible, the construction right-of-way would be cleared by mowing to a height of not less than 6 inches rather than by blading.

Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp

Vernal pool fairy shrimp and vernal pool tadpole shrimp are found in two types of habitat within the project area: natural vernal pools and human influenced nonnatural ponding areas. Construction of the proposed project could cause the temporary loss of the water-retaining capabilities of vernal pools or nonnatural ponding areas, which could result in the direct mortality of adults and disruption of the life cycle of these species in pools within the construction right-of-way. Construction during the nonbreeding season could result in the loss of resting eggs, which could potentially reduce local populations the following year. Construction during the breeding season could disrupt breeding activities of a portion of a pool's population. Failure to recontour and seal vernal pools after construction could impact their future ability to support these species. Potential impact on subpopulations of these species that occur in natural vernal or sandstone pools is considered more significant because of the scarcity of these types of natural habitat and the difficulty of replacing them with comparable compensation habitat. It would be possible to prevent impact on natural vernal pools by minor realignment of the proposed right-of-way and restriction of the construction right-of-way in the vicinity of the pools.

Vernal pool fairy shrimp and vernal pool tadpole shrimp also appear to opportunistically colonize nonnatural ponding areas along county roads and railroad rights-of-way. These areas include drainage ditches, road scrapes, tire ruts and low areas where water collects against the roadbed. The potential impact on these species in nonnatural ponding areas is considered to be less than that occurring in natural environments because nonnatural ponding areas are subject to frequent disturbance and occur commonly throughout the range of vernal pool fairy shrimp and vernal pool tadpole shrimp. The North Mainline would disturb nonnatural ponding areas along the Southern Pacific right-of-way, and the Sacramento Mainline would disturb nonnatural ponding areas along the Central California Traction right-of-way and county road rights-of-way. This secondary impact would not be avoided because the railroads and county roads often have the least potential to result in impact as compared to a route that would traverse through adjacent natural lands. Additional field surveys will be performed to determine the extent to which vernal pool fairy shrimp and vernal pool tadpole shrimp occur in these nonnatural ponding areas before a complete analysis of the impact on these species can be performed.

Impact on natural northern claypan vernal pools and sandstone pools would be avoided where feasible by minor route realignments. Where realignment would not be feasible, the following mitigation measures are proposed in addition to the general mitigation measures listed in section 5.6.2:

- Exclusion zones would be established by flagging the perimeter of all pools in or adjacent to the construction right-of-way. All construction activities would be prohibited or minimized within the exclusion zones.
- These portions of vernal pools disturbed by construction as well as any surrounding areas that could influence the hydrology of the pools would be restored and recontoured.
- The topsoil from the floor of the vernal pools would be segregated and stored for subsequent replacement following trench closure. The trench fill would be compacted to restore impermeable conditions and the topsoil replaced to ensure that some if not all of the eggs in the topsoil would be returned to the pools for populating the vernal pools the next rainy season.

Impact on nonnatural ponding areas would be evaluated in consultation with the FWS after additional field surveys are conducted during the appropriate season. Once the extent of the potential impact and the type of habitat affected are better defined, Mojave would prepare a mitigation plan that addresses onsite mitigation of impact on secondary habitats. No habitat compensation for the loss of nonnatural ponding areas would be required.

◆ **Although vegetation occurring in these ponding areas are not characteristic of vernal pools, we recommend the following mitigation measures be included in the plan to address the known presence of listed species:**

- **Segregating the topsoil, which could contain encysted eggs, during the dry period before construction.**
- **Restoring the depression including replacing the topsoil, recontouring, and compacting the soils to restore hydrologic conditions.**

At this time, we do not expect that compensatory acreage would be required for impact on natural vernal pool fairy shrimp and vernal pool tadpole shrimp habitat because Mojave intends to avoid all natural vernal pools and sandstone outcrop; however, Mojave's detailed engineering has not been completed at this time so total avoidance is not certain. Because vernal pool creation is an experimental procedure and reestablishment success is uncertain, avoidance is by far the preferred mitigation measure. We recommended preparation of a site-specific vernal pool restoration plan if avoidance is not possible (see section 5.4.3.1).

Valley Elderberry Longhorn Beetle

Clearing of the construction right-of-way could result in the removal of blue elderberry, *Sambucus caerulea*, with stems larger than 1.0 inch in diameter. Plants of this size have the potential to support the boring larval stage of Valley elderberry longhorn beetle and, therefore, should be considered suitable habitat. The presence of exit holes on the elderberry stems indicates the presence of valley elderberry longhorn beetle. Mortality of individual beetle larvae would occur if the removed stems were occupied. The loss of suitable habitat might only be temporary if the plant's root system is left intact or if the plant is transplanted or replaced following construction. Permanent habitat loss could occur if no measures were taken to reestablish the elderberry plants removed. Habitat loss could occur at stream crossings where blue elderberry is present within the construction right-of-way; however, it is likely that most, if not all, elderberry plants could be avoided by minor route realignments or special construction techniques. Impact on suitable habitat would be avoided by directional drilling under these streams except for Mill, Mosher, and Laguna Creeks where crossed by the Sacramento Mainline. Realignment might not be feasible to avoid two small clumps of blue elderberry in the City of Lemoore.

Impact on blue elderberry plants at Mill, Laguna, and Mosher Creeks would be avoided by minor realignments during the final survey of the construction right-of-way. A biologist would assist the surveyors in selecting an alignment that would minimize impact on suitable valley elderberry longhorn beetle habitat. An attempt would be made to locate the edge of the right-of-way at least 20 feet from the dripline of each elderberry plant. The width of the construction right-of-way could also be restricted in the vicinity of the elderberry plants to avoid impact on occupied habitat. Exclusionary fencing and warning signs would be placed around the stem clusters to avoid inadvertent damage to the plants.

We do not expect project construction to result in the loss of valley elderberry longhorn beetle habitat. If the final survey of the construction right-of-way were to indicate that impact on suitable habitat would occur, a detailed assessment of the presence of valley elderberry longhorn beetle and the quality of the habitat would be prepared. The assessment would include the precise location, height, and diameter of all elderberry shrubs, their general condition, and the presence or absence of adult exit holes. Mojave would then choose an alternative construction method that would avoid impact on the habitat or prepare a mitigation plan to compensate for the loss of habitat in consultation with the FWS. The plan would follow the "General Compensation Guidelines for the Valley Elderberry Longhorn Beetle" (FWS, 1994).

Recurved Larkspur, Hoover's Wooly Star, and Brittlescale

The potential project impact on the recurved larkspur would be the loss of all or a portion of the existing recurved larkspur population due to clearing of the right-of-way. Disturbance of the construction right-of-way could prevent the natural reestablishment of this species and revegetation efforts following construction. Direct mortality as a result of construction activities would be avoided or reduced by minor route realignments or restricting the construction right-of-way. The outside perimeters of the construction corridor would flagged as a reference for biologists and construction personnel. No activities would be conducted outside of the flagged area. Realignment of the construction right-of-way would avoid direct impact on this species. If it is not possible to avoid the entire population, the mitigation measures listed below would be taken to minimize the impact on this species.

Clearing of the 30-foot-wide right-of-way during construction could result in the loss of all or a portion of the existing Hoover's wooly star population near the west end of the Coalinga Segment. Realignment of the right-of-way to avoid this subpopulation could be difficult because of a cultural resources site to the north and good quality saltbush scrub habitat to the south. Recent field surveys indicated that Hoover's woolly star is much more widespread than thought when it was originally listed. The California Native Plant Society (CNPS) downlisted Hoover's woolly star from List 1B to List 4 in the latest edition of the "Inventory of Rare and Endangered Vascular Plants of California" (CNPS, 1994). Impact on this small subpopulations should not significantly affect the overall viability of this species. If it is not possible to avoid this species, the measures listed below would be taken to minimize impact on this species.

Construction would disturb a portion of the brittlescale population discovered on the North Mainline. The plants found in this population appear to tolerate some level of disturbance. Many individuals were found in open scalds created by tire ruts along the western edge of grassland habitat. Because brittlescale is an annual plant, restoration of the seed bank and topsoil should result in the germination and flowering of individual plants in subsequent seasons.

The preconstruction surveys would verify the exact location of the population. If in the proposed right-of-way, minor route realignments would be made where possible to avoid or minimize impact. Realignment to avoid this population might not be feasible because moving the alignment further east would result in the loss of a greater portion of the population and impact several natural vernal pools. The route could not be realigned to the west because the SP railroad right-of-way through this area joins the right-of-way for State Highway 99. If it is not possible to avoid the entire population, the measures listed below would be taken to reduce the impact to less than significant.

The following mitigation measures are proposed, in addition to the general measures listed in section 5.6.2, to minimize the impact on the recurved larkspur, Hoover's wooly star, and brittlescale:

- Establishment of exclusion zones with high visibility flagging around all plants that would be avoided within or adjacent to the construction right-of-way. The zone should extend a minimum of 10 feet from the edge of the population or the dripline of individual plants.
- Collection of seeds, cuttings, or entire plants from the effected population for subsequent replanting in the right-of-way. Should this prove infeasible, seed from a nearby population would be obtained and planted in an attempt to maintain the regional genetic pool. Known plant populations would be monitored throughout the growing season to identify the optimal time to collect seed or cuttings.
- Grading to return the planting site to its original contours.
- Segregation and stockpiling of topsoil apart from subsoils for subsequent replacement.
- Development of success criteria (survivorship requirements) to measure the effectiveness of mitigation measures in protecting and ensuring the continued viability of the population.
- Development and implementation of multi-year monitoring to verify successful impact mitigation.

Bakersfield Cactus

All individual Bakersfield cactus plants were avoided during the construction of the original Mojave pipeline by minor realignment or restriction of the construction right-of-way. Construction of the full 25 miles of Loop 4 required for the proposed Kern River expansion would necessitate an additional 20 feet of construction right-of-way on the east side of the existing pipeline. Individual cactus plants in the existing subpopulations might occur in this additional right-of-way, especially in the population occurring between MP 11 and MP 12. No impact on Bakersfield cactus would occur from the project configuration to serve either additional Customer Group 1 or 2.

An effort would be made to minimize impact on Bakersfield cactus by restricting the construction right-of-way in the vicinity of known populations. The preconstruction surveys should confirm that no new cactus plants have become established within the construction right-of-way. If avoidance is not feasible, individual cactus plants should be removed, held in a nursery until construction is completed, and transplanted to their original locations and orientations when climatic conditions are favorable. If it is impractical to transplant large plants, the cactus pads should be separated and planted in the right-of-way.

Spiny-Sepaled Button Celery and Other Sensitive Plant Species

Construction in or adjacent to vernal pools supporting spiny-sepaled button celery could damage the habitat characteristics required to maintain a viable population. This species requires a significant inundation period to produce flowering individuals; however, it appears to be able to survive under disturbed conditions. A population was found in pools that are subject to periodic discing as part of dryland farming operations. The pipeline right-of-way would be downslope from the vernal pools; therefore, construction-related activities should not affect the hydrology of the pools.

The vernal pools containing spiny-sepaled button celery are at least 50 feet from the fenceline between the SP railroad right-of-way and the agricultural land containing the vernal pools. It should be possible to avoid affecting this population by restricting the width of the construction right-of-way in the vicinity of the pools.

5.6.3.3 Coast Ranges - San Francisco Bay Area

San Joaquin Kit Fox

The impact on the kit fox in the Coast Ranges - San Francisco Bay Area and the mitigation measures to reduce the impact would be as described in section 5.6.3.2 for the Central Valley. The potential for construction-related mortality would also depend on the quality of habitat adjacent to the construction right-of-way and the density of kit fox in the area.

Project construction of the core project and either alternative Customer Group 1 and 2 would result in the temporary loss of 398.45 acres of nonnative grassland and oak woodland habitat in the Coast Range. Mojave and the resource agencies disagree over the appropriate habitat compensation ratio for the temporary loss of habitat caused by construction in the interior Coast Ranges. The FWS and DFG have recommended a compensation ratio of 1.1:1 for the temporary loss of habitat in native grassland in the Coast Ranges whereas Mojave has proposed a compensation ratio of 0.1:1.

- **We recommend that Mojave provide compensation for the San Joaquin kit fox habitat at a ratio of 1.1:1 to offset the temporary disturbance caused by project-related activities in the Coast Ranges.**

Golden Eagle

Construction-related activities could cause nest abandonment by adult eagles nesting within 0.5 mile of the construction right-of-way. Golden eagles are highly sensitive to human disturbance and could abandon nests any time before fledgling chicks. Clearing of vegetation including the potential clearing of nest trees could result in the loss of historic nest sites. Mojave has proposed minimizing the removal of mature trees along the entire right-of-way by making minor realignments or restricting the width of the right-of-way in the vicinity of trees. Nevertheless, some mature trees may be removed. No evidence of past eagle nesting activity was found in trees or rock outcrops within or adjacent to the construction right-of-way during the field surveys. It is unlikely that the removal of trees from the construction right-of-way would have a significant impact on the availability of nest platforms for golden eagle.

The measures to mitigate impact on nesting golden eagles would primarily focus on prevention of nest abandonment during project construction and would be implemented when pipeline construction would occur within potential golden eagle nesting habitat during the nesting season from March through July. No mitigation of construction-related impact would be necessary for construction occurring from August through February. In addition to the general construction mitigation measures listed in section 5.6.2, the following measures are proposed to minimize construction-related impact on golden eagle:

- The preconstruction surveys of potential golden eagle nesting habitat would be conducted at the beginning of the nesting season in March and again 30 days before construction to identify active nests within 0.5 mile of the construction right-of-way if construction would begin in the breeding season. The surveys results would be provided to the DFG for evaluation of each nest site.
- Following the preconstruction surveys but before construction, exclusion zones would be established around all active golden eagle nest sites. The radius of the exclusion zone would be determined by consultation with the DFG but would likely be 0.5 mile. Construction-related activities, especially vehicle activity and equipment storage, would be prohibited within the exclusion zones until the nestlings have fledged.

◆ **Additionally, we recommend avoiding the removal of nest trees within the construction right-of-way. If nest tree removal is unavoidable, replacement should be discussed on a case-by-case basis with the DFG. We also recommend that the nesting season be extended to August 15 or until all fledglings leave the nest.**

Double-Crested Cormorant

The potential nesting colony observed in Shell Marsh could be affected during project construction if verified as a nesting site. Construction activities could cause in nest abandonment or reproductive failure; however, Shell Marsh is already subject to significant disturbance from traffic on Interstate 680, which crosses the west side of the Marsh. There would be no temporary loss of habitat or direct impact on adults or juveniles because the potential nesting colony is approximately 0.4 mile from the right-of-way.

The proposed route reflects rerouting from the crest of the hill on the east side of Shell Marsh to the surface road right-of-way at the base of the east side of the hill. Noise and physical disturbances from construction should not disturb wildlife in the marsh.

The preconstruction surveys would verify the presence of a nesting colony of double-crested cormorant in Shell Marsh. If an active nesting colony is present, the DFG would be notified, and the status of the colony would be evaluated before construction could proceed.

Suisun Song Sparrow

Construction activities would result in a temporary loss of Suisun song sparrow habitat and the potential disturbance of individual birds. Clearing of the right-of-way, if conducted during the nesting season, could result in loss of nests or nest abandonment and reproductive failure. We expect that nesting pairs displaced by clearing the right-of-way would quickly construct new nests in adjacent habitats, therefore, construction-related impact would not be significant. Temporary habitat loss of approximately 1.9 acres of potential Suisun song sparrow habitat would occur during construction, but should not significantly effect to the existing sparrow population nor cause long-term impact on the viability of this subspecies.

Although no significant impact on Suisun song sparrow would occur as a result of the project, in addition to the general mitigation measures for construction in wetlands listed in section 5.4, the following mitigation measures would be taken to further reduce the impact of the project:

- If possible, all shrubs would be cleared from the construction right-of-way before the nesting season in order to prevent sparrows from selecting nest sites within the right-of-way.
- The preconstruction surveys within 14 days of initiating construction to identify nests within the construction right-of-way. Any nests located within the right-of-way would be flagged and monitored. An exclusion zone would be established within a 20 foot radius of each nest.

Western Pond Turtle

Project construction could result in the temporary loss of pond turtle habitat and the potential disturbance of individual pond turtles. Trench excavation and right-of-way clearing could potentially cause mortality or decrease the turtle's reproductive success by destroying turtle nests in sandy soils. In addition, turtles could become trapped in trenches and inadvertently buried. Vehicular traffic could also result in direct mortality, especially during the winter months when turtles are found in upland habitats.

Temporary loss of wetland habitat capable of supporting pond turtle could occur during construction; however, disturbance of wetland habitats would be minimized by the general mitigation measures listed in section 5.6.2. Temporary loss of habitat would not be significant because wetland habitat can either be avoided or restored following construction. In most cases, additional pond turtle habitat is available on either side of the construction right-of-way.

Mitigation measures to reduce impact on the pond turtle would focus on the prevention of injury and mortality of adult turtles. Potential impact would be avoided to the extent possible by minimizing construction in wetland habitat by minor route realignment or restricting the width of the construction right-of-way. In addition to the general mitigation measures listed in section 5.6.2, the following measures are proposed to protect pond turtles:

- The preconstruction surveys would be performed within 14 days of starting construction in areas that support suitable habitat for pond turtles to determine whether turtles are present within the construction right-of-way. Where occupied habitat cannot be avoided, turtles would be captured and relocated to suitable habitat. Once the turtles have been removed, drift fences would be placed along the edges of wetland habitat adjacent to the right-of-way to prevent adult turtles from returning.
- Stream, pond, and canal banks in occupied habitat would be reconstructed in a manner that would provide hibernacula and basking sites for pond turtles if approved by the party responsible for levy or bank management. Chunks of concrete rip-rap or other suitable materials would be semiburied above the 100-year flood level.

- The monitoring of trenches would be increased during the rainy season to remove adult turtles that could become trapped as they move from wetland habitats to adjacent upland areas.
- When possible, construction within occupied turtle habitat would be conducted during the active season from February through mid November. Any construction in occupied habitat outside this period would be authorized by the resource agencies.

Alameda Whipsnake

No impact on the Alameda whipsnake or its habitat is anticipated on the portions of the proposed route that have been surveyed for biological resources. If occupied Alameda whipsnake habitat is present on the unsurveyed portions of the route, project construction could result in the temporary loss of habitat, the potential disturbance of individual whipsnakes and potential burrows, and a temporary decline in prey species. Trench excavation and right-of-way clearing could potentially cause direct mortality by destroying occupied burrows or decreased reproductive success by affecting breeding during the breeding period. In addition, whipsnakes could become trapped in trenches and inadvertently buried. Vehicular traffic could also result in direct mortality, especially during the active season.

Preconstruction surveys would be performed on parcels in the Coast Ranges that were not accessible during the 1993 and 1994 field surveys to identify occupied Alameda whipsnake habitat (see table 5.6.3-2). If the surveys are performed when Alameda whipsnake is likely to be inactive, its presence would be assumed where suitable habitat is encountered. If occupied Alameda whipsnake habitat is encountered during the surveys, the DFG would be consulted to evaluate impact and appropriate mitigation measures. Where possible, temporary loss of whipsnake habitat would be mitigated by minor route realignments. If avoidance of whipsnake habitat is not feasible, the mitigation would be similar to that proposed for the blunt-nosed leopard lizard in section 5.6.3.2. At present we do not expect the project to result in the loss of Alameda whipsnake habitat; however, if occupied habitat is found on the unsurveyed portions of the proposed route, compensation acreage for temporary habitat loss would be determined by agency consultation.

◆ **If occupied habitat cannot be avoided, we recommend that off-site compensation for temporary loss of habitat be provided at a 3:1 ratio.**

San Francisco Garter Snake

Construction of the Hunters Point Segment on the east side of the Caltrans right-of-way between MP 18.35 and MP 18.55 could temporarily disturb wetland habitat known to be occupied by San Francisco garter snake. Although the center of the pipeline right-of-way would be inside the railroad right-of-way, a portion of the 30-foot-wide construction right-of-way could be within the adjacent wetland habitat. Clearing and trenching activities within the occupied San Francisco garter snake habitat could injure or kill adult snakes, especially during the winter months when adult snakes are hibernating in upland hibernacula, and disrupt breeding activities. Potential impact is less likely from May through October when San Francisco garter snake is active. If suitable wetland habitat is available adjacent to the construction right-of-way, the snakes may be expected to move out of the area while construction activity is occurring.

It might be possible to minimize impact on San Francisco garter snake by realigning to the west side of the Caltrans right-of-way between MP 18.35 and MP 18.55 which is currently being considered by Mojave. The crossing of the Loma Alta Canal would be drilled rather than trenched;

therefore, no impact would occur along the alternative alignment. If the realignment is not feasible, the mitigation measures would be similar to those recommended for giant garter snake in section 5.6.3.2.

◆ **If avoidance is not possible, we recommend that, prior to construction, Mojave prepare a mitigation plan in consultation with the FWS and DFG to minimize impact to this species.**

California Tiger Salamander

Two types of tiger salamander habitat could be affected by the proposed project: (1) breeding and reproductive habitat associated with wetlands including cattleponds and (2) aestivation habitat used by adults in upland grasslands and woodlands in the vicinity of the wetlands. Destruction of wetland habitat would result in the greatest loss of tiger salamanders because it could cause the reproductive failure of an entire local breeding population. Adult salamanders returning to the wetland to breed would not encounter suitable habitat in which to lay their eggs, and larval salamanders might not have sufficient time to complete the juvenile life stage. Trench excavation and right-of-way clearing could potentially cause direct mortality of adult tiger salamanders by destroying occupied small mammal burrows with the greatest losses in areas with high densities of ground squirrel burrows. If the areas of concentrated burrows are close to a potential reproductive wetland, they are more likely to contain adult tiger salamander. Nevertheless, it is extremely difficult to predict whether adult tiger salamanders are present in a burrow. No outward sign of activity is apparent, and no identifying characteristics have been reported in the literature. Impact on adult California tiger salamander could also occur in the breeding season when adult salamanders leave their burrows and migrate to wetland areas to breed. Salamanders could become trapped in trenches and inadvertently buried if the trench is between the wetland and the aestivation burrows. Vehicular traffic could also result in direct mortality of adult salamanders during the breeding season.

Before construction, Mojave would conduct a habitat analysis to identify potential breeding habitat within 1 mile of the proposed route and measure ground squirrel burrow density within the construction right-of-way. If good-quality habitat were encountered, Mojave would attempt to realign the route to avoid the habitat before relying on other mitigation measures to reduce mortality. Mojave would demonstrate to the satisfaction of the FWS and DFG that it has made a reasonable attempt to avoid all good-quality tiger salamander habitat by minor route realignments. In addition to the general mitigation measures listed in section 5.6.2, the following measures are to minimize impact on California tiger salamander in areas of occupied habitat that could not be avoided by realignment:

- Conduct night surveys to capture and relocate salamanders when adult salamanders are active around the mouths of burrows during the rainy season.
- Remove adult salamanders from the construction right-of-way by creating one-way drift fences around occupied habitat if the final right-of-way is surveyed before the rainy season. When the adult salamanders migrate to their reproductive wetland habitat, the burrows would be closed and the salamanders prevented from returning by closing the openings in the drift fences.
- If the right-of-way is between the wetland breeding area and the burrows, delay construction activities until after the breeding season. California tiger salamanders typically lay their eggs during or shortly following a major storm between late December and late February but may be delayed until March if conditions were unfavorable in the previous months.

- Excavate occupied burrows by hand if construction occurs when it is impossible to employ the above mitigation measures. Confirmation of the presence or absence of adult salamanders would be attempted with a portable fiber-optic scope prior to excavation. Captured salamanders would either be relocated to a wetland habitat or used for scientific research such as ongoing genetic studies or captive breeding programs.

◆ **If habitat avoidance is not possible, we recommend that, prior to construction, Mojave prepare a mitigation plan in consultation with FERC, SLC, and FWS. The plan should include restoration and/or compensation of habitat, including ponds and their watersheds that will result in no net loss of habitat.**

California Red-Legged Frog

Construction activities could result in the temporary loss of red-legged frog habitat, direct mortality of adults and tadpoles within the wetland habitats, and the potential disturbance of adult red-legged frogs during the breeding season. Trench excavation and right-of-way clearing within wetland habitats that support California red-legged frog could potentially cause direct mortality of both adults and tadpoles. The temporary loss of habitat could result in decreased reproductive success by eliminating egg-laying sites and wetlands required for larval growth. In addition, adult frogs could become trapped in trenches and inadvertently buried. Vehicular traffic could also result in direct mortality. Noise and construction activity during the breeding season could disrupt the courtship behavior of adult frogs within wetland habitats. We expect that all direct impact on wetland habitat could be avoided with minor realignments of the construction right-of-way or by directionally drilling. The only remaining potential impact would be the indirect effects of breeding disruption and the potential mortality of adult frogs in upland habitats if construction were to occur during the wet season.

Direct mortality as a result of construction activities would be minimized by minor route realignments in areas where potential red-legged frog habitat has been identified. The construction right-of-way would be clearly marked, and exclusion fencing would be used when wetland habitat is adjacent to the right-of-way. The construction right-of-way would be outside wetland habitat and the adjacent riparian zone that supports California red-legged frog wherever possible. In addition to the general mitigation measures listed in section 5.6.2, the following measures would be implemented to further reduce mortality and ensure the frog's breeding success:

- The preconstruction surveys would identify occupied California red-legged frog habitat on the basis of the auditory response of frogs.
- Disruption of breeding would be avoided by prohibiting construction within 1/8 mile of occupied wetland habitat during the breeding season from February through March.
- The monitoring of trenches would be increased during the rainy season to remove adult frogs that could become trapped as they move from wetland habitats to adjacent upland areas.
- Construction would be prohibited in occupied wetland habitat from January 15 though September 15 if avoidance of the habitat through realignment is impossible.

If the temporary loss of occupied wetland habitat were unavoidable, a mitigation plan for habitat compensation would be prepared and incorporate the FWS mitigation guidelines, which include a sliding scale of habitat compensation ratios based on the number of years the compensation habitat is in place prior to project construction.

Longhorn Fairy Shrimp

The impact of project construction on the longhorn fairy shrimp would be the same as described for the vernal pool fairy shrimp and vernal pool tadpole shrimp in the Central Valley in section 5.6.3.2.

Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp

The preconstruction surveys would be performed on parcels in the Coast Ranges that were not accessible during the 1993 and 1994 field surveys to identify vernal pools and pools of standing water in sandstone outcrops (see table 5.6.3-2). If the surveys are performed when adult stages of longhorn fairy shrimp are not likely to be found, its presence would be assumed where suitable habitat is encountered.

Impact on northern claypan vernal pools and sandstone pools would be avoided where feasible by minor route realignments. Where realignment would not be feasible, the mitigation measures would be the same as those listed in section 5.6.3.2.

Where avoidance and/or restoration are deemed insufficient mitigation, compensatory acreage may be required. At this time, it is not anticipated that compensatory acreage will be required, as Mojave intends to avoid all natural vernal pools. If construction-related activities result in the temporary loss of wetland habitat, a mitigation plan that includes habitat compensation will be prepared for review by the FWS.

See the recommendation in section 5.6.3.2 regarding a site-specific vernal pool restoration plan.

Heartscale, Brittlescale, Valley Spearscale, and Palmate-Bracted Bird's Beak

Mojave has aligned the proposed route to avoid impact on a population of heartscale and other sensitive species found in alkali lowland habitat west of Laughlin Road. Nevertheless, additional populations could occur in unsurveyed alkali lowland habitat elsewhere in the Coast Ranges (see table 5.6.3-2). Construction activities could disturb portions or entire subpopulations of these species.

The preconstruction surveys of inaccessible alkali lowland habitat would be performed during the appropriate flowering period to verify the presence of these sensitive plant species. If a population is discovered, reasonable attempts would be made to avoid as many individual plants as possible through minor realignments or restriction of the construction right-of-way. If it is not possible to avoid the entire population, the mitigation measures listed in section 5.6.3.2 for sensitive plant species in the Central Valley would be taken to minimize the impact on these species.

Large-Flowered Fiddleneck and Santa Cruz Tarplant

No populations of large-flowered fiddleneck or Santa Cruz tarplant were observed during the field surveys, but potential habitat occurs in nonnative grasslands in the Coast Ranges along the North Mainline that were inaccessible. If present, construction activities could disturb portions of these plant communities.

The preconstruction surveys of inaccessible nonnative grassland habitat would be performed during the appropriate flowering period to verify the presence of these sensitive plant species. If a population is discovered, reasonable attempts would be made to avoid as many individual plants as possible through minor realignments or restriction of the construction right-of-way. If it is not possible to avoid the entire population, the mitigation measures listed in section 5.6.3.2 for sensitive plant species in the Central Valley would be taken to minimize the impact on these species.

Contra Costa Wallflower and Antioch Dunes Evening Primrose

The 30-foot-wide construction right-of-way for the Antioch Segment would be entirely within a railroad right-of-way as it passes along the southern edge of the Antioch Dunes Ecological Reserve. Nevertheless, dust and other construction-related disturbance could affect individual primroses and wallflowers growing along the fenceline. Little vegetation of any kind is present within the railroad right-of-way, indicating that herbicides are periodically applied and precluding the presence of Antioch Dunes evening primrose or Contra Costa wallflower within the construction right-of-way.

Mojave is presently considering alternative alignments farther from the reserve boundary. Even a move to the south side of the railroad right-of-way would greatly reduce the potential impact. If a realignment is not feasible, the following mitigation measures should prevent impact on individual plants:

- Increase dust suppression measures in the vicinity of the preserve to prevent dust from accumulating on the plants.
- Flag plants growing on the boundary of the preserve and restrict the width of the construction right-of-way near these plants.
- Station an environmental monitor along the boundary of the preserve whenever construction activities are in progress.

TABLE 5.6.3-1

Summary of Impact and Mitigation for Sensitive Species along the Proposed Route

	Status a/		
Species and Impact	State	Federal	Mitigation a/
ANIMALS			
San Joaquin kit fox	T	E	
Construction-related mortality b/			Complete preconstruction surveys to identify dens; avoid dens where feasible by minor route realignments; hand excavate and fill dens prior to construction; conduct trench inspections twice daily and install an escape ramp if a fox is found; adhere to agency protocols in appendix D.
Temporary loss of habitat c/			Reclaim all disturbed areas within occupied habitat; acquire acres of compensatory habitat for temporary impact as follows: in grasslands south of Highway 152, a ratio of 0.3:1 will be used; in chenopod scrub, a ratio of 1.1:1 will be used. In chenopod scrub and grassland communities north of Highway 152, a ratio of 1.1:1 will be used. Using a compensation ratio of 1.1:1 for impact to chenopod scrub in the Central Valley, 44 acres of compensatory lands will be required if either Customer Group is served. In non-native grasslands in the Central Valley, using a ratio of 0.3:1 requires that 40 to 47 acres of compensatory lands be provided to off-set impact if Customer Group 1 or 2 are served, respectively. In the Coast Ranges, all potential habitat is assumed to be occupied. Therefore, given a ratio of 1.1:1, 415 or 401 acres of compensatory lands will be required to off-set temporary impact to nonnative grasslands, if Customer Group 1 or 2 are served respectively. Occupied marginal (isolated) habitat will be identified during preconstruction surveys and compensation will be on a case-by-case basis depending on the size in consultation with agencies.
Blunt-nosed leopard lizard	E	E	
Construction-related mortality b/			Conduct preconstruction surveys within potential habitat; where possible, limited construction will be to the period from November 1 to April 1 when the species is dormant; hand-excavate and destroy known burrows or refuges within the construction zone, allow lizards to escape prior to construction.
Long-term loss of habitat c/			Reclaim all disturbed areas; provide compensatory habitat as part of San Joaquin kit fox mitigation. No mitigation is required for permanent habitat loss because no aboveground facilities will be located within identified leopard lizard habitat.
Desert tortoise	T	T	
Construction-related mortality b/			Conduct preconstruction surveys to locate burrows; avoid direct impact burrows where route realignment are feasible; use a fiber optic scope to examine burrows; hand-excavate burrows that cannot be avoided prior to construction; inspect trenches three times a day; allow only qualified biologists to handle desert tortoises; monitor construction to prevent take of tortoises.

TABLE 5.6.3-1 (cont'd)

Species and Impact	Status a/ State	Status a/ Federal	Mitigation a/
Long-term and permanent loss of habitat c/			Reclaim ROW per revegetation requirements; provide compensatory habitat in new areas outside previously disturbed right-of-way and at compressor stations sites at the full compensation ratio based on the Category of BLM habitat, and previously disturbed areas at an adjusted ratio that takes into account the delay in substantial recovery caused by redisturbance (see appendix D). For Category 1 habitat within Loops 1, 2 and 3 and assuming Kern River expansion, a total of 124 and 80 acres of compensatory lands will be required to off-set impact to previously disturbed and undisturbed areas, respectively, within the construction ROW. For Category 3 habitat a compensation rate of 1.0 is used regardless of other factors. Therefore, a total of 213 and 99 acres respectively, are required to off-set impact to previously disturbed and undisturbed areas within Loops 1, 2 and 3; the previously undisturbed acreage for Category 3 habitat includes the Amboy and Daggett Compressor Stations.
Mojave ground squirrel	T	C2	
Construction-related mortality b/			Conduct preconstruction surveys to locate burrows; avoid direct impacts on burrows where feasible by minor route realignments. If avoidance is not possible, hand-dig known burrows prior to construction.
Long-term loss of habitat c/			Restore construction ROW per revegetation requirements; provide compensation for habitat loss as part of Desert tortoise compensation.
Tipton kangaroo rat	E	E	
Short-nosed kangaroo rat	CS2	C2	
Construction-related mortality b/			Conduct preconstruction surveys within potential habitat; wherever feasible, avoid burrows by minor rerouting. If these burrows cannot be avoided, notify the FWS and DFG. With concurrence and under their supervision, hand-excavate the burrows or trap and relocate kangaroo rats immediately outside the construction ROW in suitable habitat in an attempt to reduce mortality.
Long-term loss of habitat c/			Reclaim disturbed areas per revegetation requirements. Long-term loss of habitat associated with this species will be compensated for as part of San Joaquin Kit Fox compensation.

TABLE 5.6.3-1 (cont'd)

	Status a/		
Species and Impact	State	Federal	Mitigation a/
Swainson's hawk	T	C3	
Construction-induced reproductive failure b/			Conduct preconstruction surveys to identify active nests (i.e., used during one or more of the last 5 years) within 0.5 mile of the right-of-way; surveys should start March 1 and continue weekly through April. Avoid construction within 0.5 mile of an active nest during the breeding season (March 1 through August 15) or until fledglings are no longer dependent on nest tree habitat, which may be as late as September 15. If it is not possible to avoid construction within 0.5 mile of an active nest, the DFG on a case-by-case basis; follow agency protocols in appendix D (Staff Report re: Mitigation for Impacts to Swainson's Hawks in the Central Valley of California, November 1994).
Permanent loss of nest trees b/			Avoid by minor realignments; if unavoidable, discuss replacement with agencies. No loss of nest trees is anticipated. Mitigate for removal of specimen oak trees per the revegetation requirements.
Golden eagle	CSC	-	
Construction-induced reproductive failure c/			Conduct preconstruction surveys to identify active nests; no construction within 0.5 mile of active nests during nesting season (March 1 - August 15) or until fledglings leave the nest. If it is not possible to avoid construction within 0.5 mile of an active nest, consult with the DFG on a case-by-case basis.
Permanent loss of nest trees c/			Avoid by minor realignments; if avoidance is not feasible, discuss replacement with agencies. No loss of nest trees is anticipated. Mitigate for removal of specimen oak trees per revegetation requirements.
California tiger salamander	CSC	C1	
Construction-related mortality c/			Minimize impact on habitat by conducting preconstruction habitat analysis to identify (1) potential breeding habitat within 1 mile of the proposed route and (2) ground squirrel burrow density within the construction ROW. If good-quality habitat is identified, avoid direct impact or ponds and their immediate watersheds by minor route realignments and/or narrowing of the ROW. Where avoidance is not feasible, capture and relocate salamanders during night surveys. Create drift fences, delay construction until after the breeding season (December - March) using a fiber optic scope, and hand-excavate burrows whenever necessary. Relocate captured salamanders to similar habitat or use for scientific research.
Temporary loss of habitat c/			If habitat avoidance is not possible, in consultation with the FWS, prepare a mitigation plan to include restoration/ compensation of habitat, including ponds and their watersheds, that will result in no-net-loss of habitat. With implementation of the revegetation requirements, no permanent loss of habitat will occur for this species

TABLE 5.6.3-1 (cont'd)

Species and Impact	Status a/ State	Status a/ Federal	Mitigation a/
Vernal pool fairy shrimp	-	T	
Longhorn fairy shrimp	-	E	
Vernal pool tadpole shrimp	-	E	
Construction-related mortality b/			Avoid or minimize direct impact on natural vernal pools by minor route realignments or ROW narrowing; establish flagged exclusion zones around pools in or adjacent to the ROW; where minor realignments occur, they should not affect the upland hydrology of the vernal pool complex; where vernal pools cannot be avoided, either acreage acquisition or restoration must result in no-net-loss of habitat. Restoration will include topsoil segregation, compaction to restore impermeable conditions, and replacement of topsoil containing the eggs.
Temporary loss of habitat c/			In the event that avoidance of all natural vernal pools is not possible, a site-specific mitigation plan will be prepared in consultation with USACE, FWS, and DFG. Follow FERC staff's Procedures when crossing vernal pools. Off-site compsensation will be required at a ratio of 4:1. Where nonnatural ponding areas occur, confirm the presence of listed species prior to construction; where listed species are present, segregate the topsoil containing encysted eggs during the dry period prior to construction; after construction, restore the area by replacing the topsoil, recontouring, and compacting soils to restore hydrologic conditions.
California red-legged frog	CSC	C1	
Construction-related mortality b/			Conduct preconstruction surveys based on auditory response of frogs. Construction within 1/8 mile of wetland habitat is prohibited during the breeding period (February through March). No construction can occur in occupied wetland habitat from January 15 through September 15.
Temporary loss of habitat c/			If temporary loss of occupied wetland habitat is unavoidable, prepare a mitigation plan in consultation with USFWS prior to construction to determine compensation on a site-specific basis; at a minimum, restore per revegetation requirements. With the implementation of the revegetation requirements, no long-term loss of habitat will occur for this species.
Alameda whipsnake	T	C1	
Construction-related mortality b/			Conduct preconstruction surveys in potential habitat; presence will be assumed where suitable habitat encountered; avoid direct impact on rock outcrops that provide suitable habitat by minor route realignments or restricting the construction ROW.
Temporary loss of habitat c/			Restore temporary loss of habitat according to the revegetation requirements; where suitable habitat cannot be avoided, assume it is occupied. Restoration for temporary habitat loss will be conducted at a 3:1 ratio.

TABLE 5.6.3-1 (cont'd)

	Status a/		
Species and Impact	State	Federal	Mitigation a/
Valley elderberry longhorn beetle	CSC	T	
Construction related mortality b/			Avoid direct impact on blue elderberry bushes by minor route realignments, drilling stream crossings, or restricting the width of the construction ROW; fence bushes within the ROW and use warning signs to avoid inadvertent damage to plants; wherever possible, locate the edge of the ROW at least 20 feet from the dripline of each bush.
Temporary loss of habitat c/			If the loss of blue elderberry bushes during construction is unavoidable, prepare a mitigation plan following the General Compensation Guidelines for the Valley Elderberry Longhorn Beetle in appendix D (FWS, 1994).
Giant garter snake	T	PE	
Construction-related mortality b/			Avoid construction during dormant periods (October-March); where possible, avoid impact by minor route realignments.
Temporary loss of habitat c/			Restore temporary loss of habitat according to the revegetation requirements; where suitable habitat cannot be avoided, assume it is occupied and prepare a mitigation plan prior to construction following draft agency protocols in appendix D (DFG, 1995). With implementation of the revegetation requirements, no long-term loss of habitat will be associated with this species.
San Francisco garter snake	E	E	
Construction-related mortality b/			Avoid construction during dormant period (October-March); where possible, avoid impact by minor route realignments.
Temporary loss of habitat c/			Restore temporary loss of habitat according to the revegetation requirements; where suitable habitat cannot be avoided, assume it is occupied and prepare a site-specific mitigation plan prior to construction in consultation with FWS and DFG. With implementation of the revegetation requirements, no long-term loss of habitat will be associated with this species.
Burrowing owl	CSC	-	
Construction-related mortality c/			Conduct preconstruction surveys to identify active burrows; avoid active burrows with minor realignments, and excavate nonnesting burrows within construction ROW; before the breeding season, place one-way doors on any burrows within the ROW; establish exclusion zones around any burrows in or adjacent to the ROW if owls are not removed before the nesting season; follow agency burrowing owl protocol in appendix D (Draft Staff Report on Burrowing Owl Mitigation, September 1994).
Temporary loss of habitat c/			Restore habitat according to the revegetation requirements.
Double-crested cormorant	CSC	-	Verify presence of nesting colony in Shell Marsh during preconstruction surveys; if present, consult with DFG prior to construction.

TABLE 5.6.3-1 (cont'd)

Species and Impact	Status a/		Mitigation a/
	State	Federal	
Suisun song sparrow	CSC	C2	
Construction-related mortality c/			No construction-related mortality is expected.
Temporary loss of habitat c/			Prior to the nesting season, clear shrubs to prevent sparrows from selecting nesting sites within the ROW; conduct preconstruction surveys and flag and monitor any nests within the construction ROW; exclusion zones will be established 20 feet around nests.
Western pond turtle	CSC	C1	
Construction-related mortality c/			If possible, avoid construction during dormant period (mid November through January); conduct preconstruction surveys to locate and remove adult turtles from the construction ROW; install exclusionary fencing in occupied habitat.
Temporary loss of habitat c/			Restore habitat according revegetation requirements; where suitable habitat cannot be avoided, assume it is occupied. With implementation of revegetation requirements, no long-term loss of habitat will be associated with this species.
PLANTS			
Foxtail cactus	CNPS 1B	C2	
Construction-related mortality b/	RED 2-2-3		Restrict or realign the ROW to avoid where possible. If avoidance is not possible, excavate entire plant, trim the roots, and replant in the northwestern shade of creosote bush in the same orientation it had prior to removal.
Bakersfield cactus	E, CNPS 1B	E	
Construction-related mortality b/	RED 3-3-3		Restrict or realign the ROW to avoid where possible. If avoidance is not possible, individual plants will be removed, held in a nursery and transplanted after construction. If large plants cannot be transplanted, pads will be separated and planted in the ROW.
Hoover's wooly star	CNPS 4 RED 1-2-3	T	
Recurved larkspur	CNPS 1B RED 1-2-3	C2	
Heartscale	CNPS 1B RED 2-2-3	C2	
Brittlescale	CNPS 1B RED 3-2-2	C2	
Valley spearscale	CNPS 1B RED 2-2-3	C2	
Mojave eriophyllum	CNPS 1B RED 2-2-3	C2	
Palmate-bracted bird's beak	E, CNPS 1B RED 3-3-3	E	
Large-flowered fiddleneck	E, CNPS 1B RED 3-3-3	E	

TABLE 5.6.3-1 (cont'd)

Species and Impact	Status a/ State	Status a/ Federal	Mitigation a/
Santa Cruz tarplant	E, CNPS 1B	C1	
Construction-related mortality b/	RED 2-3-3		Conduct preconstruction surveys of ROW in areas of potentially suitable habitat and those areas not yet surveyed; avoid any populations located by minor route realignments. Establish exclusion zones 10 feet from the edge of the population or the dripline. Maintain regional genetic pool by collecting cuttings and seeds from the affected or nearby populations. Restore habitat according to the revegetation requirements.
Antioch dunes evening primrose	E, CNPS 1B RED 3-3-3	E	
Contra Costa wallflower	E, CNPS 1B	E	
Construction-related mortality b/	RED 3-3-3		Realign or relocate the ROW if possible to move route further away (no plants are located within ROW). Additionally, dust suppression measures will be increased in the vicinity of plants; plants growing closest to the ROW will be flagged and monitored during construction.

---

a/ Mitigation based on our informal conferences with the BLM, FWS, and DFG to date.
b/ Mitigation other than avoidance might not reduce impact to less than significant.
c/ On the basis of our informal consultations to date, proposed mitigation will reduce impact to less than significant.

TABLE 5.6.3-2

Summary of Sensitive Species Habitats Potentially Affected Along the Proposed Route

Sensitive Species	Occupied Habitat a/ (acres)	Potential Habitat (acres)	Potential Habitat Not Surveyed (acres)	Remarks
Mojave Desert				
Animals				
Desert Tortoise	527 b/	697	0	Assumes Kern River Expansion
Mojave Ground Squirrel	0	191	0	Assumes Kern River Expansion
Burrowing Owl	0	697	0	Assumes Kern River Expansion
Plants				
Mojave Eriophyllum	16	697	0	Assumes Kern River Expansion
Foxtail Cactus	1	697	0	Assumes Kern River Expansion
Central Valley				
Animals				
Swainson's Hawk	35/26 c/	1,316/1,280	64/77	
Vernal Pool Fairy Shrimp	0.5/1.5	2.8/3.8	2.3/2.3	Vernal Pool Fairy Shrimp and Tadpole Shrimp share the same habitat
Vernal Pool Tadpole Shrimp	0.5/1.5	2.8/3.8	2.3/2.3	
San Joaquin Kit Fox	163/195	1,027/988	0	
Tipton Kangaroo Rat	3/0	56/0	0	
Burrowing Owl	19	3,588/3,634	83	Anywhere along proposed alignments is potential habitat
Blunt-nosed leopard lizard	154	154	0	Assumes Kern River Expansion
Short-nosed Kangaroo Rat	13	13	0	
Valley Eldeberry Longhorn Beetle	6	6	0	

TABLE 5.6.3-2 (cont'd)

Sensitive Species	Occupied Habitat a/ (acres)	Potential Habitat (acres)	Potential Habitat Not Surveyed (acres)	Remarks
Giant Garter Snake	--	--	--	No field surveys performed
Plants				
Recurved Larkspur	0.4	283	0	
Hoover's Wooly Star	0.2	41	0	
Brittlescale	0.9	283	0	
Valley Spearscale	--	--	--	Not found along alignment in Central Valley
Bakersfield Cactus	0.8	283	0	
Spiney-sepaled Button Celery	0.7	0.7	0	
Coast Ranges - San Francisco Bay Area				
Animals				
Burrowing Owl	0	712/864	0	Anywhere along proposed alignments is potential habitat
San Joaquin Kit Fox	415/401	415/401	--	No field surveys were performed
California Tiger Salamander	--	471/457	--	No field surveys were performed for ground squirrel burrow densities
California Red-legged Frog	2.0/3.4	72/67	--	No field surveys were performed
Western Pond Turtle	4.2/4.2	34/36	1.4	
Alameda Whipsnake	--	5.5	--	No field surveys were performed
San Francisco Garter Snake	0.7	0.7	0	
Golden Eagle	--	670	--	No field surveys were performed
Double-crested Cormorant	--	--	--	Not found along alignment in coast ranges

TABLE 5.6.3-2 (cont'd)

Sensitive Species	Occupied Habitat a/ (acres)	Potential Habitat (acres)	Potential Habitat Not Surveyed (acres)	Remarks
Suisun Song Sparrow	–	23	--	Coastal marsh vegetation is potential habitat
Longhorn Fairy Shrimp	0.45	49	33	
Plants				
Brittlescale	0	28	14	Brittlescale and heartscale share the same habitat as does valley spearscale and Palmate-bracted bird's beak
Heartscale	0	28	14	
Valley Spearscale	0.8	28	14	
Palmate-bracted Bird's Beak	0	28	14	
Large-flowered Fiddleneck	0	471/457	334	Large-flowered fiddleneck and Santa Cruz tarplant share the same habitat
Santa Cruz Tarplant	0	471/457	334	
Contra Costa Wallflower	0	0.7	0	Contra Costa Wallflower and Antioch Dunes Evening Primrose share the same habitat
Antioch Dunes Evening Primrose	0	0.7	0	

---

a/ Based on field surveys completed to date.

b/ See table 5.6.3.1-1 for a detailed breakdown of Desert tortoise occupied habitat by BLM category.

c/ Where two acreage numbers are given separated by a slash, the first number corresponds to the pipeline configuration to serve Alternative Customer Group 1 in addition to the Core Customer Group, and the second number corresponds to the pipeline configuration to serve Alternative Customer Group 2 in addition to the Core Customer Group.

5.7 LAND USE, TRANSPORTATION, RECREATION, AND VISUAL RESOURCES

5.7.1 Land Use

5.7.1.1 Criteria for Evaluating Impact and Determining Significance

Impact on land use is considered significant and would require additional mitigation if project construction or operation would:

- Conflict with existing land use plans, policies, or regulations established by a jurisdiction directly affected by the project.
- Cause a long-term reduction in agricultural productivity.
- Conflict with approved residential or commercial development plans.

5.7.1.2 General Impact and Mitigation

Impact on land use along the proposed route would result from the clearing of the entire construction right-of-way for the installation of the pipeline, maintenance of the permanent right-of-way, and operation of the aboveground facilities. The construction right-of-way would consist of a combination of temporary and permanent right-of-way. The temporary right-of-way would be work space that would be returned to the landowner following construction and allowed to return to its previous condition and use. All rights and interests to the permanent right-of-way would be retained by Mojave. In all cases, Mojave would negotiate for the use of the land both during construction and operation of the proposed project.

The primary land use impact of the proposed project would be acreage of land affected. Depending on the additional customer group selected, the total acreage required would be about 5,437 or 5,692 acres for temporary construction right-of-way and about 628 or 632 acres for permanent right-of-way. By land use type, these acreages are given in table 5.7.1.2-1.

TABLE 5.7.1.2-1

Right-of-Way Acreages Required By Land Use Type

	Construction Right-of-Way		Permanent Right-of-Way	
	Acres	Percent of Total	Acres	Percent of Total
Agricultural	1,908 - 2,108	35	262 - 257	42 - 41
Range/Open Land	2,384 - 2,369	44 - 42	177 - 170	28 - 27
Residential	88 - 66	2 - 1	6 - 7	1
Industrial/Commercial	884 - 1,020	16 - 18	158 - 164	25 - 26
Other	171 - 218	3 - 4	23 - 32	4 - 5

Table 5.7.1.2-2 lists the acreages affected in the various land use types, which are discussed below.

We reviewed the land use plans of the 15 counties crossed by the proposed route and verified that no conflicts exist. The minor route variations suggested by various city agencies are discussed in section 3.4.

Agricultural Land

Agricultural land that would be affected by the proposed pipeline project include croplands, almond, olive, walnut, and citrus orchards, vineyards, pasture, and fallow fields. Impact on agricultural areas during construction would include the loss of standing crops, orchard trees, and vineyards in the construction right-of-way and a possible decrease in crop yield resulting from topsoil loss and soil compaction (see section 5.2 for impact on and mitigation for actively cultivated agricultural land). Land used for construction would take row crops out of production for up to one growing season; hay fields and pastures would take up to 2 years to return to previous production levels. Walnut and almond orchards within the permanent right-of-way would be affected by the permanent loss of these vegetation types because the easement would not permit the replanting of these types of trees above the pipeline (see Easements below). Vineyards and other types of orchards could be reestablished, resulting in long-term rather than permanent impact. Compensation to landowners for crop, orchard, and vineyard losses would be determined during easement negotiations.

Residential Areas

The proposed construction right-of-way is within 50 feet of numerous residences. In most of these cases, the pipeline would be placed within streets or railroad rights-of-way (see table 4.7.1.1-3). Although the primary effects on residences, i.e., noise, dust, and traffic, would be temporary and localized, Mojave would mitigate them by:

- Reducing work space requirements.
- Reducing the size of work crews and equipment.
- Limiting the hours of construction to times of low noise sensitivity, i.e., daylight hours.
- Minimizing the length of time that the trench is left open.
- Using specialized construction techniques that limit the amount of space needed for construction and the amount of time the trench is left open.

Examples of these specialized construction techniques are:

- Sewer-line/stove-pipe construction in which a limited length of trench is dug, a section of pipe is laid and welded into place, and that section of the trench is backfilled immediately.
- Drag-section construction in which a separate work space is required for prefabrication of long pipeline segments. After the trench has been dug, the long pipeline segment is brought to and laid in the trench. It is welded in place, and the trench is backfilled.

TABLE 5.7.1.2-2

Acreages That Would Be Affected by the Construction and Operation of the Proposed Pipeline

	Residential		Industrial/ Commercial a/		Vineyard/Orchard		Other/ Agricultural		Range		Other		Total	
	C	O	C	O	C	O	C	O	C	O	C	O	C	O
Core Project														
North Mainline	6	1	432	92	313	61	518	93	676	134	29	7	1974	388
Sacramento Mainline	37	4	18	2	120	5	262	21	0	0	47	1	484	33
Coalinga Segment	0	0	61	9	36	6	227	36	74	11	8	1	406	63
Sanger Segment	0	0	1	0	36	1	1	0	2	0	0	0	39	1
Livingston Segment	0	0	1	0	0	0	0	0	0	0	0	0	1	0
Ceres Segment	0	0	3	0	1	0	5	1	0	0	0	0	9	1
Modesto B Segment	0	0	15	0	2	1	0	0	0	0	0	0	17	1
Tracy Segment	2	0	0	0	0	0	0	0	0	0	13	1	15	1
Palo Alto Segment	0	0	153	20	7	1	17	3	166	23	21	3	364	50
Antioch Segment	7	0	8	2	0	0	0	0	0	0	0	0	15	3
Fremont Segment	2	1	42	6	0	0	0	0	0	0	12	3	56	10
Loop 1	0	0	0	0	0	0	0	0	141	0	0	0	141	0
Loop 2	0	0	0	0	0	0	0	0	348	0	0	0	348	0
Loop 3	0	0	0	0	0	0	0	0	208	0	0	0	208	0
Loop 4	0	0	0	0	49	4	64	4	114	1	0	0	227	9
Lindsay Segment	0	0	6	3	0	0	49	0	0	0	10	0	65	3
SUBTOTAL	54	7	739	134	563	79	1,141	158	1,729	178	140	16	4,369	562
Additional Facilities to Serve Alternative Customer Group 1														
Famoso Alternative	0	0	75	10	124	14	168	21	48	8	4	1	419	54
Kingsburg Segment	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Turlock A Segment	0	0	4	0	2	0	5	0	0	0	0	0	11	0
Lathrop Segment	14	0	2	0	7	0	7	0	0	0	0	0	30	0
Tracy Segment	0	0	0	0	0	0	0	0	0	0	14	2	14	2
Oakland Segment	19	1	64	14	2	0	1	0	8	0	14	3	108	18
SUBTOTAL	33	1	145	24	135	14	182	21	56	9	32	6	583	74
Additional Facilities to Serve Alternative Customer Group 2														
Lindsay Alternative	0	0	17	0	157	8	164	3	35	1	15	2	388	14
McFarland Segment	0	0	0	0	29	1	5	0	0	0	0	0	34	1
Malaga Segment	0	0	1	0	0	0	0	0	0	0	1	0	2	0
Madera Segment	0	0	0	0	11	4	0	0	0	0	12	3	23	7
Fairmead Segment	0	0	0	0	7	2	11	4	0	0	0	0	18	6

TABLE 5.7.1.2-2 (cont'd)

	Residential		Industrial/ Commercial a/		Vineyard/Orchard		Other/ Agricultural		Range		Other		Total	
	C	O	C	O	C	O	C	O	C	O	C	O	C	O
Turlock Segment	0	0	12	4	0	0	0	0	0	0	0	0	12	4
Ripon Segment	0	0	0	0	2	1	5	2	0	0	0	1	7	3
Sacramento Segment (A-159)	0	0	1	0	0	0	34	5	0	0	2	4	37	9
Tracy Segment (A-160)	12	2	0	0	0	0	0	0	0	0	9	1	21	3
Tracy Segment (A-161)	0	0	3	1	0	0	3	1	0	0	1	0	7	2
Antioch Segment (A-174)	0	0	11	1	0	0	0	0	0	0	7	3	18	4
Martinez Segment (A-172)	0	0	0	0	0	0	0	0	6	1	2	0	8	1
Hunters Point Segment	0	0	236	23	0	0	0	0	0	0	0	0	236	23
San Francisco Segment	0	0	0	0	0	0	0	0	0	0	5	0	5	0
SUBTOTAL	12	2	281	29	206	16	222	15	41	2	76	13	816	77

a/ This category includes some residential land use that cannot be segregated from industrial, which may overstate industrial/commercial area and understate residential area.

C = Construction
O = Operation

To further minimize construction-related impact on residential areas:

◆ **We recommend that, for all residences within 50 feet of the construction work area, Mojave:**

- **Not remove mature trees or specialized landscaping within the construction work area unless necessary for the safe operation of construction equipment.**
- **Restore all lawn areas and landscaping within the construction work area immediately after backfilling the trench.**
- **Fence the edge of the construction work area adjacent to a residence for 100 feet on either side of the residence to ensure that construction equipment and materials including the spoil pile would remain within the approved construction work area.**
- **Maintain a minimum of 25 feet between any residence and the edge of the construction work area or, where this is not possible, file an explanation and a site-specific plan with the FERC and SLC for the review and written approval of the Director of the OPR prior to construction. The site-specific plan should apply to the area extending at least 100 feet on either side of the residence and include:**
  - **A description of the special construction techniques Mojave would use such as reduced pipeline separation, centerline adjustment, stovepipe or drag-section techniques, pipeline crossover, or boring.**
  - **A commitment that the trench would not be excavated until the pipe is ready for installation and that the trench would be backfilled immediately after pipe installation.**
  - **A site plan drawn to scale that shows the location of the residence in relation to the new pipeline, the edges of the construction work area, the edges of the new permanent right-of-way, and the locations of other nearby residences, structures, roads, and waterbodies.** [1]

Commercial/Industrial Areas

Some commercial/industrial land would be affected by the proposed proposed route. Impact on commercial/industrial areas would be temporary and limited to the construction phase but could cause disruption, inconvenience, and potential loss of revenues. In addition, construction activities could disrupt traffic flow into and out of commercial/industrial areas, inconveniencing patrons and workers. Mojave would minimize this impact by providing steel grate access planks across the trench or right-of-way and by timing construction activities to avoid peak business periods.

1/ The FERC and SLC staffs will recommend to their respective Commissions that their additional mitigation measures (offset type in the text) be included as specific conditions to any approving Certificate issued for Mojave's project. The staffs will also recommend that Mojave be required to implement the mitigation measures that Mojave has proposed as part of the project unless specifically modified by other Certificate conditions.

Permanent Right-of-Way Easements

A long-term impact associated with pipeline operation is the encumbrance of land by the easement for the permanent right-of-way. Permanent right-of-way through open space including nonorchard agricultural land, wetlands, parks, and golf courses would be allowed to revert to preconstruction uses. The long-term impact would, therefore, not be significant. Where the pipeline would cross walnut or almond orchards, these trees could not be replanted in the right-of-way for the life of the pipeline. This permanent loss would occur on about 26.7 acres, mainly in the Central Valley. Where the existing right-of-way width is sufficient for the proposed pipeline, such as in railroad or surface road rights-of-way, no new permanent right-of-way would be necessary. The easement would prohibit certain uses of the right-of-way such as construction of aboveground structures (e.g., houses, house additions, garages, patios, or pools).

An easement is used to convey a permanent right-of-way to a pipeline operator by giving the operator the right to construct, operate, and maintain the pipeline. In return for the easement, the operator would negotiate with the landowner to determine the compensation for the loss of use of the land during construction, loss of nonreplaceable or other resources, damage to property during construction, and the encumbrance of the right-of-way after construction.

If a project has been certificated by the FERC but an easement cannot be negotiated with the landowner, the company may invoke the right of eminent domain granted under Section 7(h) of the NGA and the Rules of Civil Procedure to obtain a right-of-way. The company would still be required to compensate the landowner for the right-of-way as well as any damages caused by construction, but the level of compensation would be determined by the court according to state laws that set forth procedures for the use of eminent domain.

Because 80 percent of the proposed route is in existing right-of-way, most of Mojave's pipeline easements would be negotiated with the railroad, surface road, powerline, or pipeline right-of-way owners. Their easements range from single- to multiple-line rights varying from 10 feet to unspecified widths.

5.7.1.3 Site-Specific Impact and Mitigation

As part of the scoping process, we contacted the planning department of each city and town crossed by the proposed route. In response, these parties identified a number of potential concerns and conflicts with existing or planned developments and transportation improvement projects. We attempted to resolve these conflicts and asked Mojave to respond to these parties and address their concerns. In some cases, Mojave's response consisted of a letter that described the current routing analysis as a corridor study area only, that the exact location of the pipeline is subject to a field location survey which would not occur for several months. We have, however, assessed the environmental impact of Mojave's project on the basis of its proposed route and identified alternatives, and we have reported the results of our assessment in this document. Additional environmental analysis and the written approval of the FERC's Director of the Office of Pipeline Regulation would be required for any subsequent changes in the project location other than minor realignments to meet landowner needs that do not affect other landowners or sensitive environmental areas.

Table 5.7.1.3-1 lists the areas along the proposed route where there are potential land use concerns, i.e., on the North Mainline from MP 253.2 to MP 274.1 (if Alternative Customer Group 1 is served) or from MP 261.8 to MP 282.9 (if Group 2) and on the Coalinga, Palo Alto, Antioch, Fremont, Oakland, and Hunters Point Segments. They are discussed below by segment.

North Mainline

The North Mainline would cross an existing windfarm from approximately MP 253.2 to MP 257.2 (if Alternative Customer Group 1 is served) or from MP 261.8 to MP 265.8 (if Group 2). Several mountain ridges would be crossed perpendicularly that contain rows of windmills used to generate electric power. The pipeline would be aligned to avoid disturbing underground as well as aboveground structures. No significant impact on these facilities would occur during pipeline construction or operation because they would be treated as operating utility crossings and any potential impact would be addressed by project engineering.

The North Mainline would also cross a planned community development project known as the Cowell Ranch from MP 260.9 to MP 262.9 (if Alternative Customer Group 1 is served) or from MP 269.6 to MP 271.7 (if Group 2). If approved, Cowell Ranch would require an amendment to the existing Contra Costa County General Plan. According to the preliminary development plan and EIR for this community, it will include 6,000 residential units as well as office, industrial, commercial, and institutional facilities and open space with an 18-hole golf course (Myers, 1994b, personal communication). The North Mainline would cross the western portion of the Cowell property where open space, rural residences, and the golf course are planned, and it would avoid the north and east portions of the property where high-, medium-, and low-density, single- and multi-family residences are planned. No significant impact on the future development potential would result from pipeline construction or operation in these areas.

The North Mainline would cross proposed residential developments in the City of Pittsburg called Sky Ranch and Highland Ranch from MP 272.1 to MP 273.6 (if Alternative Customer Group 1 is served) or from MP 280.8 to MP 282.0 (if Group 2); however, neither of these developments has been approved yet (Gravel, 1994, and Bekiaris, 1994, personal communications). A planned public project, the Buchanan Road Bypass, would be adjacent to the existing powerline right-of-way and North Mainline from MP 272.2 to MP 273.5 (Contra Costa County Planning Department, 1993). Mojave would coordinate with the Contra Costa County Transportation Department and the City of Pittsburg to minimize and resolve potential construction schedule conflicts and ensure that the pipeline is properly routed through these future residential areas.

The CCWD expressed concern about the pipeline's routing near CCWD facilities, especially the Los Vaqueros Project between MP 252.7 and MP 260.5 (if Alternative Customer Group 1 is served) or from MP 261.3 to MP 269.1 (if Group 2) (see sections 3.3 and 4.7.1.1). The CCWD's specific concerns are the effects of constructing the pipeline and upgrading two temporary access roads within the Los Vaqueros watershed and the effects of the project on special status wildlife species, vernal pools, aesthetics, and future recreational use of the area. From MP 252.7 to MP 260.5 (if Alternative Customer Group 1 is served) or from MP 261.3 to MP 269.1 (if Group 2), the North Mainline would be within a utility relocation corridor that was the subject of an EIR that was prepared for the Los Vaqueros Project (CCWD, 1993). As discussed in section 3.3, we believe the proposed pipeline can be accommodated within the corridor, which is 0.5 to 1.0 mile wide. Recreational use is discussed in section 5.7.3.3.

TABLE 5.7.1.3-1

Areas of Potential Land Use Concern Along the Proposed Route

			Type of Issue			
Pipeline Segment	Mileposts	Issue	Existing Development	Proposed Development	Transportation Improvement Project	Land Use Plan Conflict
North Mainline	253.2/261.8 - 257.2/265.8	Wind farm	X			
	260.9/269.6 - 262.9/271.7	Cowell Ranch		X		
	272.1/280.8 - 273.6/282.0	Sky Ranch and Highland Ranch		X		
	272.8/281.4 - 274.1/282.8	Buchanan Road Bypass			X	
Coalinga Segment	27.8 - 31.5	Lemoore Naval Air Station	X			
Palo Alto Segment	1.2 to 7.8	South Livermore Valley Area				X
	5.3 to 5.9	Planned residential development		X		
	6.0 to 6.3	Planned residential development		X		
	23.1	Planned residential development		X		
	35.0 to 46.8	Santa Clara County trail and bikeway		X		
	41.0 to 42.0	Tasman Light Rail Line/Guadalupe Corridor Light Rail System			X	
Antioch Segment	0.3 to 0.6	Pebble Creek planned residential development		X		
	2.1 to 2.4	Shopping center expansion		X		
Fremont Segment	0	Planned industrial development		X		
	3.1	Fremont Boulevard/I-880 interchange			X	
	5.5	Auto Mall Parkway/I-880 interchange			X	
	4.6 to 7.2	Auto Mall Parkway, area of heavy traffic	X			
	5.5 to 6.1	Planned mixed-use development		X		
	14.7	Disturbance of pond embankment	X			
Oakland Segment	0 to 4.2	South Livermore Valley area				X
	3.7 to 5.7	City of Pleasanton tree planting policy				X
	1.2 to 2.2	Planned residential development		X		
	8.0 to 8.4	Planned residential development		X		
	9.0	BART extension/station			X	
	9.8 to 11.8	Dublin Boulevard road widening project			X	
Hunters Point Segment	4.9 to 9.8	Railroad/road grade separation projects			X	
	4.5 to 6.4	City of Redwood bikeway/pedestrian path		X		
	13.0 to 13.3	Relocation of CalTrain station and railline; proposed parking garage, retail and entertainment uses.		X	X	
	18.5	BART track to San Francisco Airport	X		X	
	24.4 to end	Potential landfilled hazardous substances				

Coalinga Segment

The proposed Coalinga Segment would cross the Lemoore Naval Air Station in the existing SP railroad right-of-way from MP 27.8 to MP 31.5. Construction and operation of the proposed pipeline would not have a significant impact on the station. Mojave would coordinate with the station to develop measures to reduce any potential impact.

Palo Alto Segment

The proposed Palo Alto Segment would cross the South Livermore Valley from approximately MP 1.2 to MP 9.2. (The first 4 miles of the Oakland Segment would also traverse this area.) The valley has been designated by Alameda County for the preservation and expansion of agriculture, particularly viticulture. The goals of the South Livermore Valley Area Plan include the expansion of actively cultivated crops, vineyards, and orchards from the current 2,100 acres to 5,000 acres or more. The plan seeks to limit urbanization by prohibiting the proliferation of new development on cultivable soils unless it enhances or at least does not interfere with the expansion of agriculture. In addition, the preservation of rural and scenic qualities is a stated objective (Alameda County Planning Department, 1993).

The Palo Alto Segment would cross existing vineyards for 0.6 mile, existing orchards for 0.1 mile and existing croplands for 1.0 mile within the South Livermore Valley. The remaining distance crossed in this area is currently uncultivated. Short-term impact on croplands would occur during construction, resulting in crop loss within the construction right-of-way for one growing season. Orchard and vineyard losses on the portion of the construction right-of-way allowed to revert to orchards and vineyards would constitute a long-term impact because recultivation to a productive level typically takes many years. Most orchards and vineyards would be crossed along existing road right-of-way. Compensation for crop, orchard, and vineyard losses would be commensurate with the level of impact.

Walnut and almond orchards would be prohibited on the 10-foot-wide permanent right-of-way to facilitate maintenance and aerial surveillance. This would result in about 1 acre on which no future walnut or almond orchards could be developed. Other orchards and row and field crops would be permitted, enabling the desired expansion of agricultural use to continue. In addition, because the pipeline would be buried, it would not interfere with the existing rural and scenic qualities of this largely undeveloped area. The proposed pipeline would, therefore, not significantly impact the implementation or goals of the South Livermore Valley Area Plan.

Also in the South Livermore Valley Area, the Palo Alto Segment would cross two proposed residential developments of up to 600 units each from MP 5.3 to MP 5.9 and from MP 6.0 to MP 6.3. The developments have not yet been approved by the City of Livermore or Alameda County, and a schedule for approval or construction was not available when this EIR/EIS was published (Brown et al., 1994, personal communication). Conversations with City of Livermore planners indicated, however, that a buffer zone will be established to prohibit residential development between the two powerline corridors in which the pipeline would be constructed (E. Brown, 1994, personal communication).

The Palo Alto Segment would cross the entrance and street frontage of a proposed 100-unit residential development on the north side of Scott Creek Road at MP 23.1. This development is currently in the approval process in the City of Fremont, and no construction schedule was available when this EIR/EIS was published (Harbin et al., 1994, personal communication). Impact on this future development is minimized by routing the segment adjacent to Scott Creek Road, thereby avoiding proposed residential lots. No significant impact on this proposed residential area is anticipated from the construction or operation of the proposed pipeline.

The Santa Clara County Parks and Recreation and Transportation Departments are currently updating plans for their trails and bikeways, respectively. A bikeway trail has been proposed that would use the SP railroad right-of-way between Milpitas and Palo Alto, corresponding to the Palo Alto Segment from MP 35.0 to MP 46.8 (LaFleur, 1994, personal communication). Mojave has stated that the buried pipeline would not interfere with the proposed surface trail, but Mojave's standard easement agreement prohibits any permanent structures, paved roads, or elevation changes to the surface area of the easement. Mojave would consider special easement conditions to permit a paved bikeway trail.

The Palo Alto Segment would be in the same right-of-way as the planned Tasman Light Rail Line from MP 41.0 to MP 42.0. The rail line is planned by the Santa Clara County Transportation Agency and the City of Mountain View as the northern extension of the existing Guadelupe Corridor Light Rail System in San Jose (Tsuda, 1994, personal communication). Construction of the rail line could limit construction work space or interfere with maintenance of a pipeline in this area. Mojave would consult with these jurisdictions during its detailed engineering design phase to avoid adverse impact and conflicts with the planned rail line.

Antioch Segment

The proposed Antioch Segment would be in existing roadway rights-of-way adjacent to a planned residential subdivision, Pebble Creek, from MP 0.3 to MP 0.6 and a planned Century Shopping Center expansion from MP 2.1 to MP 2.4 (Bekiaris, 1994, personal communication). Because most of the pipeline construction in these areas would occur along existing rights-of-way, the pipeline is not expected to interfere with these development plans.

Fremont Segment

The Fremont Segment could conflict with proposed transportation improvement projects in two locations in the City of Fremont. Reconstruction and improvement of the Fremont Boulevard/Interstate 880 interchange is planned, and associated major utility relocation work is currently in progress at this location, MP 3.1. In addition, construction is currently in progress at the Auto Mall Parkway/Interstate 880 interchange at MP 5.5 (Harbin et al., 1994, personal communication). Mojave would coordinate closely with CalTrans and the City of Fremont to minimize conflict and maintain the flow of traffic during construction in these areas.

Auto Mall Parkway supports high-volume traffic during the day, which is 25 to 30 percent trucks. Any major in-street construction work from MP 4.6 to MP 7.2 could significantly affect traffic flow on the parkway (Harbin et al., 1994, personal communication). Mojave would implement night construction hours if adverse effects on traffic could not be avoided by other measures. The pipeline would be within the Auto Mall Parkway right-of-way from MP 5.5 to MP 6.1 and would therefore avoid permanent impact on a planned 800-acre residential/mixed use development south of the parkway in this area.

Concern was expressed that the proposed block valve at the junction of the Palo Alto and Fremont Segments could conflict with property development along Kato Road in Fremont. Mojave has agreed to place the black valve in a utility vault within the street to mitigate this potential conflict.

At MP 14.7, the Fremont Segment would be on a narrow strip of land atop a vertical embankment adjacent to a water supply pond. The pond is used by the Alameda County Water Supply District as a groundwater recharge facility, and concerns have been expressed by the district regarding the stability of the proposed pipeline within the embankment on the north side of the railroad right-of-way. Mojave would consult with the Alameda County Water District during its detailed engineering design and make a minor route realignment if necessary to avoid damaging the pond's integrity.

Oakland Segment

As described above for the Palo Alto Segment, the Oakland Segment would cross the South Livermore Valley from MP 0 to MP 4.2 including a 0.5-mile stretch of cropland. The other 3.7 miles are uncultivated. Short-term impact would result from construction activities within the 30-foot-wide right-of-way through the cropland, but, following construction, crop production would resume as before. Impact and mitigation were discussed above for the Palo Alto Segment.

In the City of Pleasanton, the Oakland Segment would be constructed along East Vineyard Road, Chardonnay Avenue, and Bernal Avenue before entering a railroad right-of-way at MP 5.4. The city would require certain landscape design elements including mature trees along city streets in order to approve the proposed project (Swift, 1994a, personal communication). The proposed route adjacent to these streets and the permanent prohibition of trees over the pipeline could conflict with some of Pleasonton's landscape design elements; however, except for the residential portion of the route from MP 4.6 to MP 5.3, these streets are generally in the rural fringe of the city rather than in a developed suburban or urban setting. In the residential portion, landscaping alternatives that exclude mature trees and woody vegetation could be planted over the pipeline and contribute to the aesthetic requirements of the city.

The Oakland Segment could affect several proposed developments in Pleasanton and Livermore. A residential development is currently under construction south of East Vineyard Road near MP 1.2 to MP 2.2 (Brown et al., 1994, personal communication). In Pleasanton, a proposed residential development would be crossed from MP 8.0 to MP 8.4; no schedule for approval or development was available (Swift, 1994a, personal communication). Pipeline construction along road rights-of-way and coordination with the city and county planning departments and developers should minimize impact. Route variations are discussed in section 3.4.

The Oakland Segment would cross an approved aboveground Bay Area Rapid Transit (BART) extension and station at MP 9.0. Construction of the BART extension in the center median of Interstate 580 has already begun, and construction of the station is planned for 1995 (Tong, 1994, personal communication). Because the proposed pipeline would be bored under Interstate 580, surface disturbance and impact on the BART extension and station would be avoided.

The Oakland Segment from MP 9.8 to MP 11.8 would be constructed in the City of Dublin. Because Dublin Boulevard will be widened in 1995, Mojave would consult with the City's public works department during its detailed engineering design to ensure a minimum of construction conflicts (Tong, 1994, personal communication).

Hunters Point Segment

The Cities of Redwood City, San Carlos, and Belmont are planning or have already begun grade separation projects that would elevate or depress CalTrain tracks or roadways to avoid intersecting at the same grade. These projects are along the proposed Hunters Point Segment between MP 4.9 and MP 9.8 where the pipeline would parallel the tracks or approach the rail and road intersections. Specific concerns have been raised about scheduling conflicts in Redwood City where below-grade road underpass construction at Jefferson Avenue (MP 5.35) is scheduled for mid 1995. Construction at the Whipple Avenue intersection (MP 6.2) is planned for 1996 and 1997 (Bonte, 1994b, personal communication).

Other concerns were raised by the City of San Carlos, which is currently constructing elevated railroad tracks on a 16-foot-high embankment through the city. The toe of the embankment would extend to the west side of Old County Road where the pipeline would be constructed. Disturbance to this embankment during pipeline construction may affect its integrity. Concerns have also been raised about the shortage of physical space for new underground utilities within Old County Road right-of-way in San Carlos (Martin, 1994a,b, personal communications). Similar concerns were raised in Belmont. As part of the City of Belmont's planned grade separation project, existing utilities will be relocated within the Old County Road right-of-way, which would be shared by the proposed pipeline (Urgarte, 1994, personal communication). Mojave would consult with appropriate planning departments of these cities during its detailed engineering design to ensure minimal conflict and make minor route realignments if necessary.

A bike/pedestrian path is planned for the east side of the railroad right-of-way in the City of Redwood City where Mojave proposes to construct much of the Hunters Point Segment between MP 4.5 and MP 6.4 (Bonte, 1994b, personal communication). Mojave has indicated that the buried pipeline would not conflict or interfere with the path; however, Mojave's standard easement form prohibits any permanent structures, paved roads, or elevation changes to the surface area of the easement. Mojave would consider special easement conditions to permit a paved bikeway trail.

A project is proposed in the City of San Mateo that would relocate an existing CalTrain line and station two blocks north to the west side of the railroad right-of-way at First Avenue. Demolition of a two-story parking garage and construction of an underground parking garage and entertainment and retail uses are also included in the conceptual plan. Construction of this city project is anticipated to begin in 1996 (Scott, 1994, personal communication). The proposed route of the Hunters Point Segment in this area (MP 13.0 to MP 13.3) is on the west side of South Railroad Street west of and parallel to the railroad.

As part of its proposed extension to San Francisco International Airport, BART proposes to build a track from the airport to connect with the CalTrain tracks in Burlingame near MP 18.5 on the proposed Hunters Point Segment (Monroe, 1994, personal communication). The segment would parallel the CalTrain tracks and could preclude locating the BART extension below grade in Burlingame.

The portion of the Hunters Point Segment within the City of San Francisco (MP 26.4 to end) would cross areas subject to the requirements of Article 20 of the San Francisco Public Works Code, known as the Maher Ordinance (Sahm, 1994a, personal communication). This ordinance applies to all projects that disturb 50 cubic yards or more of soil bayward of the historic high-tide line indicated on the historic San Francisco maps prepared by the SLC and filed with the Recorder of the City and County of San Francisco. The ordinance requires that soil sampling and analysis be performed to identify any hazardous substances in these landfilled areas. If hazardous substances are found at levels exceeding Federal or state standards, a mitigation plan may be required that must be approved by the appropriate Federal or state agency before city approval of the proposed project. Mojave is preparing a contaminated soils survey report and general contingency plan for construction through contaminated soils (see section 5.11.4). The plan will identify all areas where there is reasonable potential for encountering contaminated soils and prescribe measures including disposal procedures that would be followed if contaminated soils are found.

Compressor Stations

Construction of the proposed Amboy and Daggett Compressor Stations would convert a total of approximately 40 acres of land designated for resource conservation to industrial/utility use. The two stations would be entirely within 2-mile-wide utility corridors on BLM CDCA land (BLM Corridors G and H). The BLM CDCA plan permits expansion of an existing transmission system and construction of associated structures such as compressor stations within designated utility corridors contingent upon BLM approval. Because of the recently passed California Desert Protection Act, the boundaries of these corridors may be changed. The BLM will address this in making its decision on whether to issue a Right-of-Way Grant across Federal land.

Depending on the additional customer group selected, an additional compressor station would be built in Famoso or Lindsay. A compressor station in Famoso would convert approximately 20 acres of agricultural land to industrial use for the life of the project. The primary land use impact would result from acquisition of land, alteration of the long-term use of the land, and preclusion of future agricultural use over the life of the project. A compressor station in Lindsay would require approximately 17 acres of land already designated for mixed commercial/industrial use. In either location, a permanent impact on land use would result from the conversion of agricultural land to commercial/industrial use; however, when compared to county or state totals of agricultural land, this conversion would not be significant. A compressor station in Lindsay would be part of an approved groundwater treatment/cogeneration project for a contaminated aquifer. Mojave would provide natural gas to the groundwater treatment/cogeneration facility, which, in exchange, would supply the compressor station with electricity.

The two new compressor units that would be added to the existing Topock Compressor Station in Arizona would be installed on previously disturbed land within the facility; therefore, no land use impact would occur. There are no residences or businesses near any of the compressor stations.

Meter Stations and Temporary Stockpile Areas

Each proposed meter station would require approximately 10,000 square feet of land adjacent to the permanent right-of-way. No significant impact is anticipated from the construction or operation of meter stations in areas designated for industrial land use. Ten meter stations are proposed in residential or commercial areas (see table 4.7.1.2-1). Impact during construction would include elevated noise and dust levels resulting from ground disturbance and the use of construction vehicles and equipment. These effects would be typical of construction sites and would be controlled using the general mitigation measures described in section 2.4.2 for construction in residential areas. Mojave's proposed mitigation for visual impact is discussed in section 5.7.4.3.

All stockpile areas would be in previously disturbed, commercially available open areas, primarily railroad yards. Stockpile areas would be used during the construction phase of the project and would revert to previous land use following construction. No significant impact on land use would result from the temporary use of the proposed stockpile areas.

5.7.2 Transportation

5.7.2.1 Criteria for Evaluating Impact and Determining Significance

Impact on transportation is considered significant and would require additional mitigation if project construction or operation would:

- Cause an increase in traffic volume that is substantial in relation to the existing traffic load and the capacity of a frequently used roadway.
- Substantially decrease the level-of-service of a roadway by hindering the normal flow of traffic for an extended time period.

5.7.2.2 General Impact and Mitigation

Pipeline construction would have a temporary impact on existing transportation systems including the increased use of roadways to transport construction materials and crews to the work areas and the open-cut crossing of county and local roads for pipeline construction. All Federal highways with two exceptions and all state routes and railroads would be crossed by boring underneath and, therefore, would not be affected. No transportation impact would be expected during the operation of the pipeline. Encroachment permits are discussed in section 4.7.2.

Traffic

Construction of the pipeline would result in increased vehicle traffic on roads between the stockpile areas and the construction right-of-way, primarily attributable to transportation of construction crews and materials to the right-of-way. Transportation routes and schedules for construction vehicles would be selected using the following criteria:

- Minimize trip length.
- Avoid roadways and bridges that cannot support frequent use by heavily-laden, multi-axle vehicles.
- Minimize traffic delays during loading and unloading at construction right-of-way access points.

Several hundred personal vehicles would be added to existing traffic volumes by the construction workforce. Trip length would depend on the point of origin and the location along the spread of a worker's designated task. By the very nature of a construction spread, the number of vehicles would be dispersed throughout the spread so the traffic impact would be temporary and not significant.

Federal and State Highway Crossings

Of the 54 Federal and state highway crossings, 52 are proposed to be crossed by horizontal boring. The North Mainline would cross State Route 198 (Sierra Boulevard) at MP 74.5/83.0 by a bridge. U.S. Highway 66 (Cross National Trails Highway) would be crossed by the open-cut method described below. No traffic disruptions on Federal or state highways are expected from the boring or bridge crossings.

County and Local Road Crossings

County and local roads would be crossed by either boring or open cutting. Local traffic flow at bore crossings is not expected to be affected; however, traffic flow at open-cut crossings would be affected. Mojave would complete an open-cut crossing within one day including pipe installation, backfilling, cleanup, and restoration. Mojave would control or detour traffic in order to minimize delay and inconvenience. Safety measures including flag persons, barriers, warning signs, lights, and pedestrian walkways would be used. All roads would either be kept open and passable, or a suitable bypass would be constructed to keep traffic flowing at all times where reasonable alternate routes are not available.

In-Street Construction

Mojave proposes to install sections of the pipeline within roads and roadway rights-of-way. In-street construction would result in traffic delays similar to those generated by open-cut crossings of roadways, and Mojave proposes to use the traffic management techniques described in section 4.7.2.

5.7.2.3 Site-Specific Impact and Mitigation

Some site-specific traffic issues were identified and are discussed in sections 5.7.2.2 and 5.7.4.2 because they are related to land use, recreation, and public interest areas.

5.7.3 Recreation and Public Interest Areas

5.7.3.1 Criteria for Evaluating Impact and Determining Significance

Impact on recreation and public interest areas is considered significant and would require additional mitigation if project construction or operation would:

- Result in the loss of a substantial portion of an established or planned recreation site during its peak use period or for more than 1 year.
- Limit access to a regionally recognized recreation area during its peak use period.
- Adversely affect designated or protected areas such as wilderness study areas or areas of special environmental concern.

5.7.3.2 General Impact and Mitigation

Impact associated with crossing recreation areas would occur primarily during the construction phase. Visual intrusion and increases in noise and dust during construction could temporarily inconvenience or restrict the activities of hikers, bikers, fishers, campers, sightseers, and other recreationists. In addition, construction activities could temporarily hinder traffic access to recreation areas by using in-street construction techniques along access routes. Because pipeline construction is generally scheduled during the summer months when use of recreation areas is high, some impact could be unavoidable. Its duration in any area would, however, be limited to several days to several weeks.

To reduce impact, Mojave would:

- Realign the proposed route through sensitive recreation areas such as trails.
- Maintain public safety and hiker access on trails.
- Provide detours around work areas on trails during construction activities.
- Water dirt and gravel roads to reduce dust caused by construction equipment.
- Restore all trails and other recreational facilities crossed as well as revegetate disturbed soils so recreational use could resume as soon as possible.

Public comments on the proposed project raised the possibility of using the right-of-way for recreational activities such as hiking, bicycling, or offroad vehicles; however, no specific proposals for joint use have been received. Joint use of the permanent easement for purposes of recreational activities is feasible but would depend on the landowner. Mojave's easements allow it to construct, operate, and maintain its facilities. The easements do not provide for an exclusive surface easement but do allow Mojave to restrict the surface use of the property in limited ways. Mojave's standard easement prohibits any permanent structures, paved roads, and elevation changes to surface areas of the easement but does not limit other surface use. Surface uses not expressly limited or addressed in Mojave's easements are controlled by the affected landowners rather than by Mojave. Consequently, Mojave has no ability to grant or reserve surface easements for recreational uses.

5.7.3.3 Site-Specific Impact and Mitigation

California Desert Conservation Area

There appears to be no direct impact on these areas designated for protection under the California Desert Protection Act of 1994; however, because this legislation was only recently enacted, further clarifications of the CDCA boundaries may occur. If we become aware of any aspects of this act that could affect this project, we will include them in the final EIR/EIS.

Roeding Park and Chassee Zoological Gardens

The North Mainline would be constructed and operated in the existing SP railroad right-of-way, which is separated from Roeding Park and Chassee Zoological Gardens by a four-lane roadway at MP 112.8/121.3. The proposed pipeline would not have a significant impact on the park or gardens.

Proposed San Joaquin River Parkway

The North Mainline would be directionally drilled under the San Joaquin River on the east side of State Route 99 at MP 120.8/129.4. As a result of using this construction method, the proposed pipeline would not have a significant impact on the recreational potential of the proposed San Joaquin River Parkway.

Los Vaqueros Reservoir, Brushy Peak Regional Park, and Vasco Caves Area

The North Mainline would cross a 7.8-mile portion of the CCWD's planned Los Vaqueros Reservoir Project beginning at MP 252.7/261.3. The reservoir would be a 100,000-acre-foot water supply reservoir within the 18,000- acre Kellogg Creek Watershed. The North Mainline would also be near the geologically sensitive Vasco Caves Area (see section 5.1). The proposed route is east of the planned reservoir within the CCWD-designated utility corridor through the watershed (CCWD, 1994). To date, 14,000 acres have been purchased, enabling CCWD to control water quality in the watershed. This voter-approved project has received environmental clearances under CEQA and NEPA, is authorized for construction commencing in 1994, and is intended to provide recreational and educational opportunities in the watershed to the general public. The EBRPD and LARPD would be permitted to develop and maintain recreational services, but water supply purposes would be paramount. The proposed pipeline would cross the watershed within 0.3 mile of LARPD's Brushy Peak Regional Park.

The CCWD's concerns are: construction equipment operator safety as a result of steep topography; potential landslides, which could adversely affect the scenic view of the ridge line from the planned reservoir; the relocation of Vasco Road, which Mojave proposes to use as an access route; unique biological, geological, and cultural resource protection; existing and approved future windpower facilities; and future water pipeline construction. The EBRPD's concerns are the potential for construction workers to damage sensitive biological and geological resources by their presence in these remote areas. These concerns are addressed in sections 5.1 (geology), 5.2 (soils), 5.5 (wildlife and fish), 5.7.4 (visual resources), 5.9 (cultural resources), and 5.12 (cumulative impact).

Currently, public access is limited in the areas acquired for the Los Vaqueros Project and restricted in areas of rare biological and geological resources; therefore, pipeline construction would not significantly affect the visiting public. The proposed pipeline would have no significant impact on the recreational potential of the planned Los Vaqueros Reservoir recreation area because the pipeline would be buried within the designated utility corridor, no aboveground structures would be built, and only a small number of trees would be removed, leaving little surface evidence of a buried pipeline.

Black Diamond Mines Regional Preserve and Contra Loma Regional Park

The North Mainline would cross Black Diamond Mines Regional Preserve in Contra Costa County from MP 268.8 to MP 269.8 (if Alternative Customer Group 1 is served) or from MP 277.5 to MP 278.5 (if Group 2). It would then immediately enter Contra Loma Regional Park. The two parks share a common boundary and connecting hiking and riding trails. Both are owned by the BOR and operated by the EBRPD. The 3,700-acre Black Diamond Mines Preserve was recently listed on the NRHP (Lindenmyer, 1994a, personal communication). Once a coal mining district, it includes historic mine openings and tunnels, an underground mining museum, and 34 miles of hiking, biking, and horseback riding trails (EBRPD, 1991). The 776-acre Contra Loma Regional Park features an 80-acre reservoir as the center of year-round boating, fishing, swimming, windsurfing, and beach activities (EBRPD, 1988a). The proposed pipeline would parallel 0.9 mile of trails in Black Diamond Mines Preserve and 0.2 mile of trails in a highly visible open area in Contra Loma Regional Park. These trails link the two recreation areas. The numbers of visitors per day who would be present in the project area were estimated to be 14 on the remote trails of Black Diamond Mines Preserve and 284 in Contra Loma Regional Park.

The main concerns regarding these recreation areas are construction-related increases in noise, restricted trail access, visual impact, and safety of trail and park users. While noise and restricted trail access would be limited to the period of construction, visual impact would continue until revegetation is successful as discussed in section 5.7.4. Mojave would maintain pedestrian access on these trails or provide for trail detours to maintain the link between the parks during construction.

Public safety should be a priority in areas where large numbers of people are likely to be present, especially in Contra Loma Regional Park where recreation activities are concentrated around the reservoir within 0.1 mile of the proposed route. During construction, open trenches and spoil piles could generate curiosity and the potential for individuals to fall into the trenches.

- **We, therefore, recommend that Mojave install temporary safety fencing and warning signs between the trench and nearby areas of high-volume public use in Contra Loma Regional Park (MP 269.8 to MP 270.8/MP 278.6 to MP 279.5).**

Sycamore Grove Park

The proposed Palo Alto Segment would cross Sycamore Grove Park east to west at about MP 6.3/6.8. The proposed Oakland Segment would branch off northward from the Palo Alto Segment and cross the park. A total of 1.1 miles of the park would be crossed if Alternative Customer Group 1 were to be served in addition to the Core Customer Group. If Alternative Customer Group 2 were to be served in addition to the Core Customer Group, approximately 0.6 mile would cross the park from east to west. The park is operated by the LARPD for nature observation and passive recreational use. The pipeline would cross the park in an area of scattered trees adjacent to an existing powerline right-of-way (Palo Alto Segment) or along a park road (Oakland Segment). The construction right-of-way would require 65 feet along the powerline right-of-way and 30 feet along the park road. The permanent right-of-way would be 0 to 10 feet wide, allowing vegetation to recover in most of the right-of-way. There would be no significant long-term impact on the park's recreational value.

Mission Peak Regional Preserve and Sunol Regional Wilderness

The proposed Palo Alto Segment would cross Mission Peak Regional Preserve for 2.5 miles beginning at MP 18.8. This dispersed recreation area is managed by the EBRPD for preservation and enhancement of open space and environmental features as well as to provide opportunities for the enjoyment and education of the public (EBRPD, 1988b). The pipeline would cross the preserve along the crest of hills adjacent and visible from the west side of the Sunol Regional Wilderness. See section 5.7.4.3 for a discussion of visual impact on Sunol Regional Wilderness and Mission Peak Regional Preserve. At MP 22.8, the pipeline would cross the Ohlone Wilderness Trail in a remote area within the preserve several miles from the nearest road access point. The trail is part of the EBRPD Regional Trail System, which is oriented to hiking, equestrian, and related uses in natural settings and links parks, local trails, and urban communities (EBRPD, 1988b). During construction, Mojave would maintain safe pedestrian access on the trail or establish temporary detours to minimize inconvenience to trail users.

Stanford University Stadium

The proposed Palo Alto Segment would cross the northern and western edges of the Stanford University Stadium property at MP 47.2 along El Camino Real and a campus road. During construction, traffic and spectator access to the stadium could be significantly impaired by large construction equipment that would be using additional work space in the road. The use of temporary traffic controls would minimize traffic-related impact during in-street construction. Stanford University would require preplanning consultation but no permit.

In addition, the proposed pipeline would affect a park-like campus setting that contains trees up to 5 feet in diameter. These trees are a unique feature of the campus entrance and valuable because of their large size and the contrast they create with the surrounding urban environment. The pipeline would be installed in the existing road right-of-way. Mojave proposes to use a 25-foot-wide construction right-of-way in this area with additional workspace proposed on the paved campus road. No permanent right-of-way would be required within the existing road. Large-diameter trees would be spared as much as possible in accordance with Stanford University's requirements by using more workspace on roads as opposed to adjacent wooded areas.

Candlestick Park Stadium and Entrance to Candlestick Point State Recreation Area

Construction of the Hunters Point Segment in the vicinity of Candlestick Park Stadium and alongside major access roads from MP 26.9 to MP 27.3 could result in significant access problems if construction occurs in the roads during football or baseball season, i.e., during any month except February and March (Sahm, 1994a, personal communication). Construction would occur on the west side of Jamestown Road across the street from the stadium, thereby avoiding the need to use parking lot space or other stadium property during construction. Traffic disruption on this road during scheduled San Francisco Fortyniners or Giants games could cause significant traffic jams extending into local streets and onto U.S. Highway 101. In addition, access to Candlestick Point State Recreation Area, which shares Candlestick Park's entrance could be impaired.

- **We recommend that Mojave work closely with Stanford University and Candlestick Park to schedule its construction activities to minimize conflicts with scheduled events.**

Shadow Cliffs Regional Recreation Area

The proposed Oakland Segment would parallel 0.1 mile of the southern edge of Shadow Cliff Regional Recreation Area near MP 4.2. The area is managed by the EBRPD for a variety of intensive public recreational uses (EBRPD, 1988b). Construction and operation of the proposed pipeline would have little impact on the recreational use of the area because the pipeline would follow the edge of the park in the Vineyard Avenue right-of-way. The proposed route would avoid intensively used recreational sites within the park and, therefore, would have only a minor, short-term impact, which would be caused by construction activities adjacent to the recreation area.

Bay Meadows Racetrack

In the City of San Mateo, the proposed Hunters Point Segment would be parallel and within 100 feet of the southern edge of the Bay Meadows Racetrack parking lot from MP 10.7 to MP 11.4; it would cross the racetrack access road at MP 11.3. Mojave proposes to use a 65-foot-wide construction right-of-way in this area, which would span 0.3 mile of existing parking lot and result in the use of 2.36 acres of parking space during construction. No permanent loss of parking space would occur. Potential construction impact is spectator traffic delays and temporarily reduced available parking spaces. Because the pipeline would be bored under the access road, effects on traffic would be minimal.

5.7.4 Visual Resources

5.7.4.1 Criteria for Evaluating Impact and Determining Significance

Two components are involved in determining levels of visual contrast: the type and extent of physical contrast and the visibility of a project facility given the landscape's ability to absorb or conceal it. Impact levels vary depending on whether an area was modified previously, the impact's duration, the visibility of the new facility, and the number of viewers.

5.7.4.2 General Impact and Mitigation

Impact on visual resources would be primarily of two types: impact resulting from alteration of terrain and vegetation patterns by pipeline construction and right-of-way maintenance and impact resulting from the construction of the compressor and meter stations. The visual impact of the pipeline segments would be primarily temporary or short-term because most of the proposed route is within or adjacent to existing railroad, surface road, or utility line rights-of-way. Long-term visual impact could result from clearing right-of-way at those few wooded stream crossings that are not directionally drilled or if soil stabilization and revegetation on steep slopes were unsuccessful. Along most of the route, however, once streams are restored and range and grassland are revegetated, the pipeline would not be visible. The visual impact resulting from constructing the aboveground facilities would be long-term but limited to the areas of the compressor and meter stations.

The mitigation measures that Mojave would implement to reduce visual impact are of two general types: strategic location and disturbance minimization. The pipeline right-of-way would generally be within or adjacent to existing right-of-way to make maximum use of the existing topography and vegetation for screening. Near travel routes, the right-of-way would be concealed from highways and other areas of public view to the extent possible. Techniques to minimize visual disturbance are:

- During the clearing of right-of-way for the pipeline, curvilinear instead of straight-line boundaries would be created in areas of potentially permanent scenic impact to minimize disturbing the landscape. To the extent practicable, grading would be done in a manner that minimizes erosion and conforms to the natural topography.
- The clearing of trees and vegetation for the pipeline right-of-way would be limited to the minimum area required.
- To the extent possible, all foliage adjacent to the pipeline and compressor and meter stations would remain undisturbed to provide maximum screening.
- Oaks, cottonwoods, and other large native trees would not be removed if avoidable by minor realignment of the pipeline. To the maximum practicable extent, the soils within the root zones of these trees would not be disturbed.
- Trees that act as windbreaks and visual barriers along highways and railroad rights-of-way would be replanted or replaced following the approved site-specific revegetation plans.

- All other timber and vegetation without value would be mechanically chipped and spread in a manner that would aid seedling establishment and soil stabilization; however, because of potential conflicts with landowner requests, revegetation specifications, and other agency-imposed measures, this might not be possible in all situations.

- Soil excavated during construction would be evenly backfilled into the cleared area or removed from the site, and the area would be graded to conform with the terrain and the adjacent land.

- Dumping of excess material on downhill slopes would be minimized.

- Cut-and-fill slopes would be rounded to break sharp unnatural edges formed at the contact between the level slope and the rounded natural landform.

- Restoration and revegetation would be done as quickly as possible for soil stabilization and to reduce the color contrast between the right-of-way and adjacent vegetation. Grasses similar to the adjacent vegetation would be used where possible to ensure that the created visual pathway would blend as much as possible with the surrounding landscape.

- If revegetation and soil stabilization on steep slopes and in scenic areas are determined to be unsuccessful during postconstruction monitoring, further restoration efforts would be made.

- Aboveground facilities would be painted a uniform, noncontrasting color to blend with the surrounding natural environment as much as possible.

5.7.4.3 Site-Specific Impact and Mitigation

Mojave Desert

The Mojave-Kern River-El Dorado EIR/EIS concluded that the portions of the Mojave Mainline that would be looped for the project would have a significant visual impact on only one visual resource in the Mojave Desert. Loop 1 between MP 1 and MP 12 would be constructed in the same area that has already experienced a significant visual impact from other projects including the Mojave Mainline. This portion of Loop 1 is within the viewshed of the Marble Mountains from both directions of Interstate Highway 40. The vegetation, currently recovering from construction of the Mojave Mainline, would be redisturbed, which would extend the recovery period by about 5 years at this location.

Central Valley

In the Central Valley the proposed Loop 4 would be constructed almost entirely within the existing East Side Lateral right-of-way. The visual character of the area would, therefore, not be significantly affected by Loop 4. The proposed North Mainline crosses several rivers (see table 4.7.4-1). Mojave would directionally drill under these rivers, which would avoid long-term visual impact and substantially reduce the short-term visual impact.

Coast Ranges - San Francisco Bay Area

Because very few heavily wooded areas are crossed by the proposed route, permanent adverse visual impact resulting from a cleared pipeline right-of-way would be limited. In urban areas, however, such as those crossed in the San Francisco Bay Area, some long-term or permanent visual impact could potentially result from clearing trees and other vegetation along existing tree-lined roadways such as Trimble Road in Santa Clara where the proposed Palo Alto Segment from MP 31.5 to MP 32.5 would be constructed under the road. Although urban areas would typically be considered as having a low value for scenic quality, the cultivation of landscaped vegetation in such areas is a valuable aesthetic contribution. The loss of established landscaping such as mature trees could constitute a significant visual impact depending on the amount removed and whether it is replaced. The preservation of mature vegetation should therefore be given special consideration, and trees should be saved wherever possible.

In the Coast Ranges-San Francisco Bay Area, the sensitive scenic resources identified along the proposed North Mainline are four county scenic highways — Somersville, Kirker Pass, Vasco, and Deer Valley Roads — and two EBRPD properties — the Black Diamond Mines Regional Preserve and Contra Loma Regional Park. The proposed Palo Alto Segment would also cross two scenic highways — Interstate 680 and Niles Canyon Road — and two regional preserve/wilderness areas.

Somersville Road — Travelers on Somersville Road, an access road to Black Diamond Mines Regional Preserve (see below), would observe pipeline construction on hills on both sides of the valley road. Because the proposed route would cross grasslands in this area, the visual impact would be temporary to short-term.

Kirker Pass Road — Travelers on Kirker Pass Road would view the North Mainline right-of-way primarily in a valley bottom where revegetation following construction has a high probability of success. The proposed route also crosses steep slopes visible from the road, and a moderate to high line and color contrast would be created during construction, drawing visual attention. Because the route crosses grassland in this area, it would result in a temporary to short-term impact until revegetation occurs.

Vasco and Deer Valley Roads — Travelers on Vasco and Deer Valley Roads would view pipeline construction on grassy hills, a temporary impact. Since revegetation would occur within a year, no permanent impact is expected.

Black Diamond Mines Regional Preserve — The proposed North Mainline route through the preserve generally follows valley bottoms but at places crosses steep sidehills, particularly between MP 268.5 and MP 269.5 (if Alternative Customer Group 1 is served) or between MP 277 and MP 278 (if Group 2). In places, the route is just outside or along the preserve boundary. In either case, the pipeline right-of-way would be visible to users of trails in the preserve for most of the route in this area. The vegetation consists primarily of grasses, which would allow the right-of-way to quickly blend with the surrounding landscape when revegetated.

Contra Loma Regional Park — The proposed North Mainline route crosses a saddle between two high peaks that form the southern boundary of the park at about MP 270.7/279.5. The construction right-of-way would create a contrast to the existing landscape that would be visible to many users of the park from the intensively used reservoir area to the parking lots and entrance road. With restoration as proposed, this impact would be short-term.

Sycamore Grove Park — The proposed Palo Alto Segment would cross the City of Livermore's Sycamore Grove Park from MP 6.3 to MP 6.8 along an electrical transmission corridor. There would be an impact because several trails within the park would be crossed, making the project highly visible to park users. If any of the many large trees in the park would need to removed, it would cause a long-term contrast, because the gap created in the tree cover would take several years to fill. The permanent right-of-way would be 0 to 10 feet wide; thus, permanent visual impact would be less than the temporary construction impact. Mitigation measures such as restoration plantings would be required in the construction right-of-way to reduce long-term impact in areas allowed to revert.

Interstate 680 — The proposed Palo Alto Segment would be within the viewshed of a designated scenic highway, Interstate 680, between MP 12.8 and MP 14.5. This area is a flat valley bottom used mostly for agriculture. Impact would be short-term because the right-of-way would quickly return to its original vegetation cover or land use. There would be no long-term visual impact.

Mission Peaks Regional Preserve and Sunol Regional Wilderness — The proposed Palo Alto Segment would enter the Mission Peaks Regional Preserve adjacent to the Sunol Regional Wilderness at MP 18.6 and would be visible from various roads and trails in the area. These are areas of rugged, steep terrain with a variety of vegetation and landforms. Visual impact would include the introduction of a linear contrast in the landscape, which could last longer than three years depending on the vegetation type disturbed. Mojave would make minor adjustments where necessary to avoid cutting the right-of-way through areas of dense tree cover or to avoid certain large "character trees," which would substantially reduce potential impact. Between about MP 21.2 and MP 23.5, the route descends a very steep grassy slope east of Interstate 680. Although this west-facing slope is visible to the heavily urbanized areas and travelers along the Nimitz Freeway (Route 17) and Interstate 680, once revegetation is successful, the visual impact would be negligible.

Interstate 580 and Dublin Canyon Road — The proposed Oakland Segment would parallel Dublin Canyon Road and Interstate 580 between MP 12.0 and MP 18.5 in an area of rolling hills to steep slopes with dense tree and shrub cover. Interstate 580 is a candidate for state scenic highway designation. Construction activities in this area would be visible to a large number of motorists on Interstate 580. There could be long-term visual impact due to a loss of trees and shrubs along the road; however, this would not create a significant impact or contrast with the adjacent environment because it would extend the existing open grasslands adjacent to Interstate 580 and Dublin Canyon Road.

Compressor Stations

Construction and operation of the three new compressor stations would result in permanent visual impact. The construction of the Amboy and Daggett Compressor Stations would introduce line, form, and color contrasts to the existing landscape; however, because they would be in areas previously identified as either not visually significant or visually significant but having no visual impact, they would not be considered a significant visual impact. If constructed, the Famoso Compressor Station would be on remote rural land, would not be seen by a large number of viewers, and would not negatively affect the visual character of the area. If the alternative Lindsay Compressor Station were constructed, it would be adjacent to the water decontamination cogeneration plant. Expansion of the existing Topock Compressor Station would result in only a minor incremental increase in visual disturbance.

Meter Stations, Block Valves, and Temporary Stockpile Areas

The new meter stations would include the permanent addition of a small building surrounded by a 6-foot-high cyclone fence. These facilities would only be visible to viewers nearby. Meter stations would, therefore, cause minor long-term impact on the quality of the landscape. The Erosion Control, Revegetation, and Maintenance Plan (appendix A) stipulates that low-maintenance vegetation be planted to shield, buffer, or otherwise conceal the aboveground structures at meter stations in high-visibility areas such as residential areas. Block valves would be minor facilities that would have a low impact on the scenic quality of the surrounding area. Temporary stockpile areas would be primarily in industrial areas such as railroad yards and would be consistent with existing visual resources in such areas.

5.8 SOCIOECONOMICS

5.8.1 Criteria for Evaluating Impact and Determining Significance

A socioeconomic impact would be considered significant and require additional mitigation if project construction or operation would:

- Cause the vacancy rate for temporary housing to fall to less than 5 percent.
- Increase the short-term or long-term demand for public services in excess of existing and projected capacities.
- Cause a long-term population increase of 3 percent or more in a county affected by the project.
- Result in the permanent conversion of more than 1 percent of agricultural land in a county to a nonagricultural use or result in the loss of more than 1 percent of the acreage planted in a county's most valuable crop.
- Result in any racial, ethnic, or socioeconomic group bearing a disproportionate share of adverse impact.

5.8.2 General Impact and Mitigation

The socioeconomic impact of the proposed project would be temporary, short-term, and primarily localized. The impact would result from the temporary increase in the number of project workers residing in a county during the construction phase. Temporary impact from population increases are estimated to last 2 to 9 months in the counties that would be crossed by the proposed pipeline.

Construction of the proposed project would result in some beneficial economic impact on the affected area. The hiring of local workers, contractor purchases of materials and supplies, and the spending of nonlocal workers would result in a short-term increase in local personal income. The project would have a long-term beneficial effect on local property tax revenues. The impact during operation would be minimal because few new permanent workers would be required. Construction impact would also include the temporary and permanent removal of agricultural land from production.

Executive Order 12898 on Environmental Justice requires that environmental analyses of proposed Federal actions address any disproportionately high and adverse human health or environmental effects on minority and low-income communities. In addition, each Federal agency must ensure that public documents, notices, and hearings are readily accessible to the public. Section 1 of this EIR/EIS describes the public notification and participation process.

Mojave's project intent is to supply natural gas to specific customers. A practical and economic route design minimizes the length of pipeline after considering all engineering and environmental effects. In this regard, Mojave's proposed route crosses many communities of varying economic and ethnic compositions throughout the Central Valley and San Francisco Bay Area. Almost exclusively, however, the proposed route is within existing road or railroad rights-of-way through these communities. Generally, the use of existing rights-of-way is environmentally preferable to constructing new rights-of-way and reduces overall effects on communities.

In section 5.7, we discuss the project-related impact on urban and residential areas. In our analysis, we considered all residences and businesses within 50 feet of the construction work area, and our mailing list includes all affected property owners without any distinction based on minority or income status. We have not identified any disproportionately high and adverse human health or environmental effects on minority and low-income communities. We believe that, with the implementation of Mojave's proposed mitigation measures, construction and operation of the project would not result in a significant impact on urban and residential areas.

5.8.2.1 Construction Phase

Construction-related population gain would result from nonlocal workers and their dependents residing temporarily in communities along the pipeline route for several months during pipeline and compressor station construction. In most areas along the route, only one construction spread would be working at any one time, but, in the vicinity of Bakersfield, Barstow, Fresno, Needles, and Visalia/Tulare, there would be some overlap of construction spreads. Table 5.8.2.1-1 shows the peak periods of construction-related population gain in these five areas. The peak nonlocal population figures were projected on the basis of the following assumptions: pipeline work crews would be 90 percent nonlocal; the average number of dependents per worker would be 0.3; workforce requirements would be those in Mojave's construction schedules and estimates. Pipeline construction crews would range from 225 to 377 workers per spread, and the duration of work in any particular area would be 1 to 2 months. Compressor station construction crews would be 100 workers each, and the duration of work would be 192 working days. Modification of the Topock Compressor Station would require 50 workers for 63 working days. Along most of the route, the construction work force would comprise one percent or less of the affected communities' population bases. The population could increase in Barstow by 3 percent and in Needles by over 8 percent for about 2 months.

Most nonlocal construction workers would likely reside in a community for 1 to 2 months except the crews working on compressor stations who would stay in or around Bakersfield, Barstow, Needles, or possibly Visalia/Tulare for up to 8 months. The workers would use visitor accommodations including hotel/motel room and RV and camp sites or seek short-term rental housing. Some workers might choose midpoints along the construction spread to reduce commute distances and moves during pipeline construction.

When both rental housing units and other visitor accommodations are considered, the supply of temporary housing would be adequate, and the impact on vacancy rates would not be significant. During the high occupancy seasons, the combined demand for temporary housing from tourists, recreationists, and project construction workers might at times exceed the supply in some communities. While this would benefit the proprietors of the local motels, RV camps, and rental units, it could result in the temporary displacement of some tourists and recreationists.

At its peak, project construction would generate about 1,900 jobs that would temporarily benefit the California economy. About 200 jobs would be filled by workers hired from the local communities, and about 1,700 jobs would be filled by nonlocal workers including some from elsewhere in California. Local hiring, while beneficial to the communities, would not perceptibly change the local unemployment levels. Construction workers would purchase goods and services

TABLE 5.8.2.1-1

Population Increases and Housing Availablity in Selected Communities Along the Proposed Route

	Bakersfield	Barstow	Fresno	Needles	Visalia/Tulare
Peak Nonlocal Population	520	637	530	460	553
Peak Nonlocal Population as Percent of Community Population	<0.5	3	0.15	>8	0.6
Peak Worker Influx Period (1995)	April - July	June - July	August - September	April - May	June
Estimated Number of Vacant Rental Units a/	1,950	482	4,385	80	497
Estimated Number of Vacant Hotel/Motel Rooms b/	945	570	1069	280	418
Estimated Number of RV/Camping Spaces c/	585	468	NA	928	168
High Occupancy Seasons	Spring, Fall	Spring, Fall	February-July, September	Spring, Fall, Summer weekends	February, Summer

---

a/ Assumes total rental units and rental vacancy rates listed in table 4.8-2.

b/ Assumes 35% vacancy rate and numbers of hotel/motel rooms listed in table 4.8-2.

c/ RV/camping spaces within 20 miles of the community (Automobile Club of Southern California, 1993a and 1993b).

locally, and retail sales would also increase because of construction-related purchases or rentals of equipment and materials. During the construction phase, the project payroll would be $76 to $78 million.

Agricultural lands that would be affected by the project include croplands, almond, olive, walnut, and citrus orchards, vineyards, pasture, fallow fields, and range land. The impact on agricultural areas during construction would be loss of standing crops, orchard trees, and vineyards in the construction right-of-way, but the amount of agricultural land within each county that would be affected by construction would be below one percent. No county would temporarily lose more than one percent of the agricultural land used to produce the most valuable county agricultural product.

5.8.2.2 Operational Phase

Operation of the pipeline and compressor stations would require about 40 new permanent employees. These employees are expected to reside in either Bakersfield or Stockton. Given the size of these communities, the increases in population would be small and therefore insignificant.

Much of the proposed pipeline route uses existing right-of-way and crosses unincorporated land. Where new easements or rights-of-way would be required, land owners would be compensated. Mojave would purchase land required for the permanent aboveground structures such as the compressor stations. The project would not displace any houses or businesses. In addition, with the exception of walnut and almond orchards, all agricultural products could be grown in the permanent right-of-way. Thus, there would be no significant permanent impact on agricultural land. Compensation for temporary losses (most crops), short-term losses (hay and pastures), long-term losses (orchards and vineyards that have long maturation cycles but can be replanted), and permanent losses (almond and walnut orchards in permanent right-of-way) would be determined during easement negotiations.

Based on a property tax rate of 1 percent of assessed rate and the estimated taxable value of a compressor station facility (but not the land) of $24.25 million, the project could result in increased property tax revenue of $650,000 to San Bernardino County and $240,000 to Tulare and Kern Counties, depending on final project design. The total cost of the pipeline would be about $390 million. Assuming a minimum property tax rate of 1 percent, the project would generate $3.9 million in revenues over all 15 affected counties.

5.8.3 Site-Specific Impact and Mitigation

As discussed in sections 5.8.2.1 and 5.8.2.2, there would be no significant impact on socioeconomic resources resulting from this project.

5.9 CULTURAL RESOURCES

5.9.1 Criteria For Evaluating Impact and Determining Significance

The proposed pipeline project could affect historic properties, which are those prehistoric and historic sites, districts, buildings, structures, and objects, including properties with traditional religious or cultural importance to Native Americans, that are listed or eligible for listing on the NRHP. To qualify for listing, historic properties must possess integrity of location, design, workmanship, feeling, and association and meet at least one of the following criteria (36 CFR 60.4):

- Be associated with events that have made significant contributions to the broad patterns of United States history.
- Be associated with the lives of people important in United States history.
- Embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, possess high artistic value, or represent a significant and distinguishable entity whose components may lack individual distinction.
- Have yielded or be likely to yield information important in prehistory or history.

The criteria used to evaluate the effects of the proposed project were those of the ACHP in its regulations for the protection of historic properties (36 CFR 800.9). A significant impact is one considered to have an adverse effect on a historic property including but not limited to:

- Physical destruction, damage, or alteration of all or part of a historic property.
- Isolation of a historic property from its setting or alteration of the setting's character when it contributes to the property's eligibility for the NRHP.
- Introduction of visual, audible, or atmospheric elements that are out of character with the property or that alter its setting.

5.9.2 General Impact and Mitigation

The FERC, SLC, and BLM would ensure that the proposed project would comply with Section 106 of the NHPA, which requires Federal agencies to take into account the effects of their undertakings on historic properties and afford the ACHP an opportunity to comment. The procedures for complying with Section 106 are outlined in the ACHP's regulations (36 CFR 800). The effects of the project on properties of traditional religious and cultural importance to Native Americans must be considered according to Section 101(d)(6) of the NHPA and the American Indian Religious Freedom Act. Acting on behalf of the Federal agencies and SLC, Mojave contacted all appropriate Federal- and state-recognized Indian tribes and interested Native Americans and sought their assistance in identifying Native American religious sites, traditional cultural properties, and other cultural resource issues of concern. The BLM must consider Native American religious and cultural concerns for the portion of the project crossing Federal lands in accordance with the Archaeological Resources Protection Act and the Native American Graves Protection and Repatriation Act.

As described in section 4.9, Mojave has completed overviews and inventoried most of the proposed project facilities. Six sites have been identified that appear to be listed on the NRHP, seven sites were recommended as eligible for listing on the NRHP, 80 sites have been evaluated as not eligible, and the remainder are unevaluated. Table 5.9.2-1 summarizes Mojave's findings regarding NRHP status of the sites identified, excluding the railroad track sites, which were all recommended as not eligible for the NRHP.

As the lead Federal agency, the FERC is responsible for officially determining NRHP eligibility and project effects in consultation with the SHPO, SLC, and BLM. Mojave's findings are currently being reviewed by the FERC, SLC, BLM, and SHPO. If they agree with the findings, sites determined to be ineligible for the NRHP would require no further consideration. Sites within the APE that were not evaluated must have their significance assessed prior to construction in those areas.

If any historic properties are identified within the APE, Mojave would be required to prepare a site-specific treatment plan indicating how impact would be avoided, reduced, or mitigated. Mitigation could include data recovery such as archeological excavation or historic documentation meeting the standards of the Historic American Building Survey or the Historic American Engineering Record. If the FERC, SLC, BLM, and SHPO agree that Mojave's recommended treatment would properly mitigate adverse effects, the ACHP would be consulted to reach a finding of no adverse effect. Once a treatment plan is approved, Mojave would implement the specified treatment measure and document, to the satisfaction of the FERC, SLC, BLM, and SHPO, that the measures were successfully completed before receiving notice to proceed with project construction.

Given the large size of this project and the present expectations that (1) few sites would be eligible for listing in the NRHP, (2) most eligible sites would be avoided, and (3) even fewer sites would require treatment/mitigation, we do not see a need for a formalized Programmatic Agreement (PA) for this project. If summary documentation is required, it will be submitted to the ACHP in accordance with Title 36, CFR, Part 800.8(d). In the event that the FERC staff later determines that a PA is appropriate, we would propose that the PA signed in 1991 for the original Mojave project be extended rather than execute a new PA.

5.9.3 Site-Specific Impact and Mitigation

Table 5.9.3-1 lists the 13 sites identified as either listed on the NRHP or recommended as eligible for listing. The table also includes Mojave's recommendations for treatment to avoid, reduce, or mitigate the project's potential effects on these sites.

Six sites are listed on the NRHP. Mojave believes that the project would have no effect on the Washington Colony Canal, which is listed on the NRHP as part of a Historic District, because the North Mainline and Sanger Segment would cross the canal outside the Historic District's boundaries in areas that do not contribute to the significance of the property. Mojave has proposed a minor reroute along the North Mainline to avoid prehistoric Site CA-CCO-310, which is listed on the NRHP as part of the Los Vaqueros District. Potential project effects still need to be assessed for the three historic railroad stations that are crossed by the Hunters Point segment (Menlo Park, San Carlos, and Burlingame). Each of the stations is listed on the NRHP. The Oakland Segment would be adjacent to Dublin Village, a town site listed on the NRHP as a Historic District. Mojave has proposed to avoid this historic property by constricting the construction right-of-way and monitoring construction to ensure that all activities are outside the Historic District's boundaries.

TABLE 5.9.2-1

NRHP Status of Sites Identified for the Mojave Northward Expansion Project a/

	Number of Sites			
Proposed Pipeline Facility	**Listed**	**Recommended Eligible**	**Recommended Ineligible**	**Not Evaluated**
Core Project				
Mojave North Mainline	2	4	31	31
Sacramento Mainline	0	0	7	23
Lindsay Segment	0	0	5	2
Coalinga Segment	0	0	8	4
Sanger Segment	1	0	2	3
Livingston Segment	0	0	0	0
Ceres Segment	0	0	0	1
Modesto B Segment	0	0	0	0
Tracy Segment	0	0	2	0
Palo Alto Segment	0	0	0	5
Antioch Segment	0	0	1	0
Fremont Segment	0	0	0	0
Loop 1	0	1	1	0
Loop 2	0	1	5	0
Loop 3	0	0	4	0
Loop 4	0	0	0	0
Additional Facilities to Serve Alternative Customer Group 1				
Kingsburg Segment	0	0	0	0
Turlock A Segment	0	0	0	1
Lathrop Segment	0	0	3	10
Oakland Segment	1	0	1	2
Additional Facilities to Serve Alternative Customer Group 2				
Lindsay Alternative Segment	0	1	5	0
McFarland Segment	0	0	0	0
Malaga Segment	0	0	0	0
Madera Segment	0	0	2	2
Fairmead Segment	0	0	0	2
Turlock A-154	0	0	0	0
Ripon Segment	0	0	0	0
Sacramento Alternative (A-159)	0	0	1	0
Tracy Segment (A-160)	0	0	0	0
Tracy Segment (A-161)	0	0	0	0
Antioch Segment (A-174)	0	0	1	0
Martinez Segment (A-172)	0	0	0	0
Hunters Point Segment	3	1	0	7
San Francisco Segment	0	0	0	0
Compressor Stations				
Topock Compressor Station	0	0	0	0
Amboy Compressor Station	0	1	0	0
Daggett Compressor Station	0	1	0	0
Famoso Compressor Station	0	0	0	0
Lindsay Compressor Station	0	0	0	0

---

a/ Does not include railroad track sites.

TABLE 5.9.3-1

Sites Listed on the NRHP or Recommended as Eligible for Listing on the NRHP That Could Be Affected by the Proposed Project

Pipeline Segment	Site	Description	Recommended Treatment
North Mainline	CA-CCO-310, listed on the NRHP as part of the Los Vaqueros District	Prehistoric rock shelter and bedrock mortar complex	Reroute the pipeline to avoid impact.
	SW-12, South Fork of the Persian Ditch, previously determined eligible for another project	Historic earthen irrigation canal (1854)	Because the portion crossed by the project does not contribute to the site's significance, no further work is recommended.
	DG-25, Briggs Canal, eligible	Historic concrete-lined irrigation canal and brick inverted siphon (1900)	Bore under the canal to avoid impact.
	KT-16, Hetch Hetchy Aqueduct, eligible	Historic water system for the City of San Francisco including 3 buried pipelines (1931-1953) and overhead electric lines (1923)	Bore under the aqueduct to avoid impact.
	KT-49, Delta-Mendota Canal, eligible	Historic concrete irrigation canal built for the Central Valley Project (1946-1953)	Bore under the canal to avoid impact.
North Mainline and Sanger Segment	LG-2 Washington Colony Canal, listed on the NRHP as part of a Historic District	Historic earthen irrigation canal (1878)	Because the portion crossed by the project is outside the Historic District boundary and does not contribute to its significance, no further work is recommended.
Lindsay Alternative	BWH-8, Friant-Kern Canal, eligible	Historic concrete irrigation canal built for the Central Valley Project (1945-1951)	Bore under the canal to avoid impact.
Hunters Point Segment	SMA-169H/CHL-955/PHI-SCL-019, Menlo Park Station, listed on the NRHP in 1979	Historic railroad depot (1867)	Effects need to be assessed.
	RT-2, Atherton Station, eligible	Historic railroad depot (1913)	Reroute the pipeline to avoid impact.
	C-313/PHI-SMA-015 San Carlos Station, listed on the NRHP in 1984	Historic railroad depot (1888)	Effects need to be assessed.
	CHL-846 Burlingame Station, listed on the NRHP in 1973	Historic railroad depot (1894)	Effects need to be assessed.
Oakland	CA-ALA-521, Dublin Village, listed on the NRHP as a Historic District	Historic town (1850)	Reduce construction ROW and monitor to stay outside of the Historic District boundaries.
Loops 1 and 2; Amboy and Daggett Compressor Stations	CA-SBR-2910-H, National Old Trails Highway and Route 66	Historic road (1915)	Effects need to be assessed.

Seven sites may be eligible for the NRHP. Mojave indicated that the project would have no effect on the South Fork of the Persian Ditch, which was determined to be eligible for the NRHP during another project, because the North Mainline would cross the ditch in an area that does not contribute to its significance. The Briggs Canal, Delta-Mendota Canal, and Hetch Hetchy Aqueduct would be crossed by the North Mainline, and the Friant-Kern Canal would be crossed by the Lindsay Alternative. All four are recommended as eligible for the NRHP, but Mojave believes effects would be avoided by boring under them. Not yet assessed are the project's potential effects on the recommended eligible Atherton Railroad Station, which is along the Hunters Point Segment, and Site CA-SBR-2910-H (Route 66/National Old Trails Highway), which could be affected by Loops 1 and 2 and the Amboy and Daggett Compressor Stations.

Through its Native American contact program, Mojave identified 25 sensitive areas. Mojave would monitor construction through them. As part of the cultural resources inventory report, Mojave submitted a plan for the treatment of human remains, cultural items, and other cultural resources that might be discovered during construction. This plan is currently being reviewed by the appropriate agencies.

When this EIR/EIS was published, Mojave had not completed cultural resources inventories for all of the proposed facilities, nor had the submitted inventory report been reviewed by the appropriate agencies. As the lead Federal agency, the FERC cannot make official determinations of NRHP eligibility and project effects until the data are complete.

◆ **To ensure that the FERC's and other cooperating agencies' responsibilities under the NHPA and its implementing regulations are met, we recommend that Mojave defer construction and use of its facilities and any staging, storage, or temporary work areas and new or to be improved access roads until:**

- **Mojave prepares and submits to the FERC, SLC, BLM, and SHPO a final inventory report, any testing and evaluation reports, and any necessary treatment plans.**
- **Mojave files with the FERC the comments of the SLC, BLM, and SHPO on all cultural resource reports and plans submitted for review.**
- **FERC Director of the Office of Pipeline Regulation notifies Mojave in writing that it may proceed.**

Mojave shall label all reports and plans identifying locations of cultural resources as "PRIVILEGED INFORMATION — DO NOT RELEASE." 1/

1/ The FERC and SLC staffs will recommend to their respective Commissions that their additional mitigation measures (offset in boldface type in the text) be included as specific conditions to any approving certificate issued for Mojave's project. The staffs will also recommend that Mojave be required to implement the mitigation measures that Mojave has proposed as part of the project unless specifically modified by other certificate conditions.

5.10 AIR QUALITY AND NOISE

5.10.1 Air Quality

5.10.1.1 Criteria For Evaluating Impact and Determining Significance

Adverse air quality impact is considered significant and would require additional mitigation if:

- Emissions from a compressor station qualify the station as a major source of air pollution or a major modification to an existing source.
- Emissions from the compressor stations are predicted to contribute to the violation or worsening of an existing violation of any Federal or state AAQS.
- Emissions from the compressor stations are predicted to cause incremental impact on the ambient air quality greater than allowable under the PSD regulations for Class I and II areas.
- Construction emissions are predicted to exceed an air district's significant unavoidable impact emission thresholds under CEQA, which are shown below in pounds per day except for the thresholds for the Mojave Desert District, which are shown in tons per year:

Air District	Unit	CO	VOCs	NO_x	PM10
Mojave Desert	ton/yr	100	25	25	15
San Joaquin	lb/day	550	55	55	80
Sacramento	lb/day	–	85	85	275
Bay Area	lb/day	150	150	150	150

5.10.1.2 General Impact and Mitigation

The proposed pipeline project could reduce air quality during construction and operation. The temporary construction impact would be construction equipment engine emissions and fugitive dust emissions from soil disturbing activities. The operation of the compressor stations could cause long-term reductions in air quality. Other than the compressor stations, the operation of the pipeline itself would result in minimal vehicular emissions. Only 40 people would be permanently employed to operate and maintain the pipeline and compressor stations.

Because the proposed project would serve either existing natural gas customers or cogeneration facilities whose air quality impact is evaluated during permitting and under CEQA, no indirect impact would result from this project.

5.10.1.3 Construction Impact and Mitigation

The emissions were calculated as unmitigated using reasonable estimates of the actual conditions in each air basin. The unmitigated emissions were then reduced using mitigation reduction efficiencies from the appropriate CEQA air quality handbook for Mojave's proposed mitigation and for Mojave's and the air district's required mitigation. The results are presented in table 5.10.1.3-1 in tons per year and pounds per day for comparison to the air district CEQA thresholds of significance.

The construction emissions from the San Joaquin Valley Air Basin and Southeast Desert Air Basin were calculated using emission factors from the South Coast Air Quality Management District's (South Coast District's) CEQA air quality handbook for all vehicles, equipment, and activities except heavy duty trucks whose emissions factors were taken from the EPA AP-42 guidance (South Coast District, 1993; EPA, 1991). The construction emissions consist of vehicle and equipment engine exhaust emissions, and PM10 emissions from construction and vehicle moving activities. The engine exhaust emissions were determined from estimated worker vehicle and delivery truck miles driven and hours of operation of construction equipment. The PM10 emissions were determined from estimated worker vehicle, delivery truck, and construction equipment miles driven on paved and unpaved roads; right of way clearing, trenching, grading, importing and exporting of fill and debris, and wind erosion of disturbed areas and soil stockpiles. The mileage, type, and number of vehicles was supplied by Mojave along with the amount of material that would be excavated and disturbed.

The construction emissions for the San Francisco Bay Area Air Basin and Sacramento Valley Air Basin were calculated using only the emission factors provided in the districts' CEQA handbooks (Bay Area District, 1985; Sacramento District, 1994). The San Francisco Bay Area Air Basin emissions consist of emissions from the worker vehicles engine exhaust emissions, overall construction activity PM10 emissions, and excavation equipment engine exhaust emissions. The Sacramento Valley Air Basin emissions consists of emissions from the worker vehicles engine exhaust emissions, grading equipment engine exhaust emissions, and grading activity PM10 emissions. The worker vehicle mileage and trips along with amounts of material excavated and disturbed were supplied by Mojave.

The mitigation measures that Mojave would use to avoid or minimize air quality impact from construction activities include:

- Requiring that at least four workers commute together to the pipeline construction sites and at least two workers commute together to the compressor station construction sites.
- Implementing a dust control plan at all construction sites in compliance with all applicable rules and regulations regarding the control of fugitive dust and respirable particulates.
- Controlling fugitive dust during construction activities by limiting the amount of right-of-way subjected to surface disturbance, by maintaining reduced speed limits, and, if necessary, by watering the right-of-way.
- Using dust control measures on all roads when dust creates a nuisance, safety hazard, or damage to the existing road (Mojave has not proposed the utilization of fugitive dust suppressant fluids other than fresh water).
- Instructing the contractor not to handle or store materials, use a road, or construct, alter, or repair any equipment without taking reasonable precautions to prevent particulate matter from becoming airborne and creating nuisance conditions. Such precautions would include:

TABLE 5.10.1.3-1

Construction Emissions Summary

Construction Emissions Status	CO	VOCs	NO_x	PM10
Mojave Desert District — SEDAB				
In Tons/Year				
Unmitigated	275	26	128	1,832
Mojave-mitigated	275	26	128	854
Mojave- and district-mitigated	261	25	121	854
District CEQA thresholds	100	25	25	15
In Pounds/Day				
Unmitigated	4,016	480	2,705	42,946
Mojave-mitigated	4,016	480	2,705	19,946
Mojave- and district-mitigated	3,815	456	2,570	19,946
San Joaquin District — SJVAB				
In Tons/Year				
Unmitigated	421	64	412	13,593
Mojave-mitigated	421	64	412	7,285
Mojave- and district-mitigated	401	61	392	4,258
In Pounds/Day				
Unmitigated	7,342	1,206	8,133	200,974
Mojave-mitigated	7,342	1,206	8,133	106,903
Mojave- and district-mitigated	6,992	1,147	7,727	62,792
District CEQA threshold	550	55	55	80
Sacramento District — SVAB				
In Tons/Year				
Unmitigated	–	0.21	0.90	31.0
Mojave- and district-mitigated	–	0.20	0.85	17.6
In Pounds/Day				
Unmitigated	–	11	47	1,636
Mojave- and district-mitigated	–	10	45	926
District CEQA threshold	–	85	85	275

TABLE 5.10.1.3-1 (cont'd)

Construction Emissions Status	CO	VOCs	NO_x	PM10
Bay Area District — SFAAB				
In Tons/Year				
Unmitigated	27	13	94	223
Mojave- and district-mitigated	27	13	94	112
In Pounds/Day				
Unmitigated	324	160	1,117	2,652
Mojave- and district-mitigated	324	160	1,117	1,336
District CEQA thresholds	550	150	150	150

Bay Area District = Bay Area Air Quality Mangement District
CEQA = California Environmental Quality Act
CO = Carbon monoxide
Mojave Desert District = Mojave Desert Air Quality Management District
NO_x = Nitrogen oxides
PM10 = Respirable particulate matter
SEDAB = South East Desert Air Basin
SFBAAB = San Francisco Bay Area Air Basin
SJVAB = San Joaquin Valley Air Basin
San Joaquin District = San Joaquin Valley Unified Air Pollution Control District
Sacramento District = Sacramento Metropolitan Air Quality Management District
SVAB = Sacramento Valley Air Basin
VOCs = Volatile organic compounds

- Where necessary, using fresh water to control dust during construction, operation, grading of roads, or clearing of land and rights-of-way.

- Applying fresh water on unpaved roads, material stockpiles, and other surfaces that could create excessive airborne particulates as a result of construction activities.

- Fully or partially enclosing material stockpiles where application of fresh water would not be sufficient to prevent particulate matter from becoming airborne.

- Matting consolidated rock blasting operations where required.

- Covering open-bodied trucks transporting materials that could become airborne when the trucks are in motion.

- Promptly removing from paved roads earth or other materials that could become airborne.

Air District Analysis

The construction emissions were calculated assuming that Mojave would comply with the mitigation requirements in the districts' CEQA handbooks, which are cited in the discussions below. Mojave would be required to submit dust control plans to the districts, and the plans would incorporate Mojave's proposed mitigation measures as well as those required by the districts. Mojave would also be required to submit evidence to the districts that all delivery trucks and construction vehicles would be maintained and operated according to the manufacturer's specifications. Because our calculations show that the thresholds for some criteria pollutants would be exceeded even after each air district's mitigation measures are implemented, we will submit the emissions calculations to the districts for their use in evaluating Mojave's plans.

The **Mojave Desert District** requires that, during construction of the pipeline and compressor stations all internal-combustion-engine-driven equipment be properly maintained and well tuned according to manufacturers specification.

As shown in table 5.10.1.3-1, after Mojave implements both the proposed mitigation measures and the additional measures required by the Mojave Desert District, the construction CO, NO_x, and PM10 emissions would exceed the district's significant unavoidable impact thresholds under CEQA. By implementing the district's required mitigation measures, emissions of VOCs would be reduced to less than significant levels under CEQA. Implementing all available mitigation measures would not reduce the CO, NO_x, and PM10 construction emissions to less than significant.

The **San Joaquin District** requires that the following mitigation measures be used during construction:

- All material excavated or graded should be sufficiently watered to prevent excessive amount of dust. Watering should occur at least twice a day with complete coverage preferably in the late morning and after work is done for the day.

- All clearing, grading, earth moving, or excavation activities should cease during periods of high winds greater than 20 mph average over one hour.

- All material transported off-site should be either sufficiently watered or securely covered to prevent excessive amounts of dust.

- Where acceptable to the fire department, weed control should be accomplished by mowing instead of discing, thereby leaving the ground undisturbed and with a mulch covering.

- All inactive portions of the construction site should be seeded and watered until grass growth is evident.

- All active portions should be sufficiently watered to prevent excessive amounts of dust.

- On-site vehicle speed should be limited to 15 mph.

- All areas with vehicle traffic should be watered periodically or have petroleum-based palliatives applied for stabilization of dust emissions.

- During rough grading and construction, streets adjacent to the project site should be swept at least once per day, or as required by the governing body, to remove silt which may have accumulated from construction activities.

- During rough grading and construction, access to the site should require the building of an apron into the project site from adjoining paved roadways. The apron should be paved or have petroleum based palliatives applied.

- All internal combustion engines driven equipment should be properly maintained and well tuned according to manufacturer's specifications.

As shown in table 5.10.1.3-1, after Mojave implements both the proposed mitigation measures and the additional mitigation measures required by the San Joaquin District, the CO, VOC, NO_x, and PM10 construction emissions would exceed the district's significant unavoidable impact thresholds under CEQA. Implementing all available mitigation measures would not reduce the construction emission impact to less than significant.

The **Sacramento District** requires that the following mitigation measures be implemented during construction of the pipeline:

- All soil piles should be watered twice daily.

- All exposed soil should be watered twice daily.

- All haul roads should be watered twice daily.

- All internal-combustion-engine-driven equipment should be properly maintained and well tuned according to manufacturers specification.

As shown in table 5.10.1.3-1, after Mojave implements both the proposed mitigation measures and the additional mitigation measures required by the Sacramento District, the construction PM10 emissions would exceed the district's significant unavoidable impact threshold under CEQA. Implementing all available mitigation measures would not reduce the PM10 construction emissions impact to less than significant.

The **Bay Area District** requires that, during construction of the pipeline, all exposed areas should be watered twice daily. As shown in table 5.10.1.3-1, after Mojave implements both the proposed mitigation measures and the additional mitigation measures required by the Bay Area District, the construction VOC, NO_x, and PM10 emissions would exceed the district's significant unavoidable impact threshold under CEQA. Implementing all available mitigation measures would not reduce the VOC, NO_x, and PM10 construction emissions impact to less than significant.

5.10.1.4 Conformity Analysis

As discussed in section 4.10.1.3, the staff is exploring how conformity analysis regulations apply to the short-term construction emissions that would be associated with the proposed project. If an analysis is required, it would be separate from the analyses for this EIR/EIS. Although the final EIR/EIS would not detail the analysis, the results would be discussed. The conformity analysis would show that emissions generated from construction equipment would conform to the SIP and would not worsen air quality in the air basins.

5.10.1.5 Site-Specific Impact and Mitigation

The estimated emissions from the compressor stations were calculated by totalling the emissions from all individual sources. The emission factors for the gas turbines are calculated from contaminant exhaust gas concentrations and EPA Fuel-Factors (F-Factors). F-Factors provide an estimate of the exhaust gas flow rate per million British thermal units (MMBtu) of fuel input. The emission factors for the internal-combustion engines are calculated from manufacturer's performance specifications and engine specific fuel consumption. The emission factors are shown below in pounds per MMBtu:

Emission Unit	NO_x	VOCs	CO	SO_2	SO_4	PM_{10}
Gas turbines	0.0924	0.0280	0.1125	0.00204	0.00006	0.01406
Internal-combustion engines	0.4059	0.4059	0.5412	0.00204	0.00006	0.01406

Topock Compressor Station

Mojave would add two 12,235-horsepower (75°F), Solar Mars T-14000, natural-gas- fired, turbine-driven compressors to the three existing Cooper Bessemer 8W330, two-cycle, clean-burn, reciprocating-engine-driven compressors. The Solar Mars turbines would emit 64 tons of NO_x per year (350 pounds per day) assuming continuous operation and full load. Table 5.10.1.5-1 gives the existing and estimated compressor station emissions. The increase in NO_x emissions would be a major modification to an existing major source and thus trigger PSD requirements. Mojave has applied for a PSD permit from the ADEQ. The emission increases for CO, SO_2, VOCs, and PM10 would not trigger PSD requirements. The maximum annual NO_2 concentration that would result from the two new turbines is predicted to be 10.70 micrograms per cubic meter ($\mu g/m^3$). The existing generators

TABLE 5.10.1.5-1

Estimated Compressor Station Emissions

Compressor Station and Compressor Type	Air District and County	Emissions (Tons/Year)						
		Pre-offset NOx	Post-offset NOx	Pre-offset VOCs	Post-offset VOCs	CO	PM10	SO_2
Topock, Turbine-driven a/	ADEQ, Mojave County	493.7	493.7	132.8	132.8	603.6	-	3.3
Amboy, Turbine-driven	Mojave Desert Air District, San Bernardino County	87.6	45.6	29.3	29.3	106.7	13.2	2.0
Daggett, Electric-driven	Mojave Desert Air District, San Bernardino County	0.5	0.5	6.8	6.8	0.65	0.02	0.002
Famoso, Turbine-driven	San Joaquin Air District, Kern County	81.9	0	31.5	0	99.8	12.4	1.8
Lindsay, Electric-driven	San Joaquin Air District, Tulare County	0.5	0.5	6.8	6.8	0.65	0.02	0.002

---

a/ Includes emissions from existing compression equipment.

and reciprocating engines would contribute 1.76 $\mu g/m^3$ to a background NO_2 concentration of 38 $\mu g/m^3$. The total NO_2 concentration is predicted to be 50.5 $\mu g/m^3$, which would be in compliance with the NAAQS and Arizona AAQS of 100 $\mu g/m^3$ for NO_x.

The Topock Compressor Station's total PSD increment would be 12.46 $\mu g/m^3$ for NO_x which would be below the maximum allowable NO_2 increment consumption of 25 $\mu g/m^3$. The Topock Table Compressor Station is the only source in the area consuming the available PSD NO_2 increment. The new turbines would include dry low NO_x burners as BACT and good combustion practices to minimize NO_x and CO emissions, respectively. These systems are more stringent than required by the NSPS. Screening level visibility modeling demonstrated no adverse impact on visibility on the nearest Class I Area, Joshua Tree National Wilderness Area, 112 kilometers to the west. Since AAQS and PSD increments are not threatened by the proposed additions, no significant air quality impact is expected.

Amboy Compressor Station

Mojave would install two Solar Modified Mars T-14000, 10,627 hp (75°F), natural gas-fired, turbine-driven compressors and a Caterpillar Clean Burn 3512, internal-combustion-engine-driven, backup generator at the Amboy Compressor Station. The station would emit 87.6 tons of NO_x per year (480 pounds per day) assuming continuous full-load operation of the turbines and operating the generator one hour per day (see table 5.10.1.5-1). The facility would be subject to NSR for NO_x since emissions would exceed the NSR threshold of 250 pounds per day. The facility would not be subject to NSR for VOCs, SO_2, PM10, and CO since emissions of these pollutants would not exceed the threshold. Mojave has applied for an authority to construct permit from the Mojave Desert District.

Amboy Compressor Station NO_x emissions would require mitigation because the NSR threshold would be exceeded. Mojave proposes to use BACT and offsets for all emissions above the threshold. Mojave would install dry low NO_x technology for BACT to minimize NO_x emissions as required by the NSR rule. The internal combustion engine for the generator would use clean-burn technology for BACT. Since NO_x and VOCs are equal contributors to the formation of ozone, the Mojave Desert District allows the use of VOC offsets for NO_x emissions as long as the VOCs emissions are discounted and an interpollutant offset ratio of 1.17 is applied. Mojave would use 769 pounds per day of VOC offsets from a metal-coating facility 50 to 100 miles from the station to offset the 230 pounds of NO_x per day that are above the NSR threshold of 250 pounds per day. The metal-coating facility emissions would be discounted 30 percent to conform with the district's clean air plan reduction rule for metal-coating facilities. In addition, the offset source would be 50 to 100 miles from the station; consequently, a distance factor of 2:1 must be used.

Because Mojave would use offsets and install BACT for all emissions exceeding the NSR threshold, and the Mojave Desert District NSR rule conforms with the SIP, the Amboy Compressor Station would not impose a significant impact on air quality.

Daggett Compressor Station

Mojave would install electric-motor-driven compressors at the Daggett Compressor Station. Three compressors would be installed if Kern River proceeds with its expansion; but only two would be installed if Kern River does not expand. A Caterpillar Clean Burn 3306, internal-combustion-engine-driven backup generator employing clean burn technology is also proposed. The backup generator would be run one hour per day and during electrical power outages.

The estimated Daggett Compressor Station emissions are presented in table 5.10.1.5-1. The emissions would be minor because the compressors would be driven by electric motors. The facility would emit 0.5 ton of NO_x per year (2.7 pounds per day) and 7.3 tons of VOCs per year (40.17 pounds per day) from the internal combustion engine, compressor blowdowns, and fugitive emissions. The facility would be below the Mojave Desert District's NSR thresholds for all pollutants and not subject to NSR. Mojave would need an authority to construct permit from the district, but the application has not been submitted.

Because BACT would be used in the internal combustion engine, the facility emissions would be below the NSR thresholds, and the Mojave Desert District's NSR rule conforms with the SIP, the Daggett Compressor Station would not impose a significant impact on air quality.

Famoso Compressor Station

Mojave would install two Solar Modified Mars T-14000, 10,165 hp (75°F), natural-gas-fired, turbine-driven compressors and a Caterpillar Clean Burn 3512, internal-combustion- engine-driven, backup generator at the Famoso Compressor Station. The compressors and generator would emit 81.9 tons of NO_x per year (448.8 pounds per day) and 31.5 tons of VOCs per year (172.5 pounds per day), assuming continuous full-load operation of the turbines and operating the generator one hour per day. The estimated emissions are in table 5.10.1.5-1. Because the NO_x, VOCs, PM10, SO_2, and SO_4 emissions would exceed the NSR threshold of 2 pounds per day, the facility would be a major source and subject to NSR for each pollutant. The CO emissions would not exceed the NSR threshold of 550 pounds per day. Mojave has applied for an authority to construct permit from the San Joaquin District.

The NSR thresholds would be exceeded, and BACT would be required for emissions of NO_x, VOCs, PM10, SO_2, and SO_4. The new turbines would include dry low NO_x technology as BACT to minimize NO_x emissions. The natural gas contract limitation of no more than 0.75 gr S/100dSCF has been accepted by the San Joaquin District as BACT to minimize emissions of PM10, SO_2, and SO_4. The generator's internal combustion engine would incorporate clean burn technology as BACT for NO_x.

Because the Famoso Compressor Station's NO_x and VOC emissions would exceed the NSR offset threshold of 10 tons per year, all VOC and NO_x emissions would need to be offset to zero. The amount of offsets required by regulation is two times the pollutant emissions since the offset sources are 15 to 50 miles from the site. Mojave proposes to use 897 pounds per day of NO_x offsets and 345.1 pounds per day of VOC offsets from sources 15 to 50 miles from the facility to fully offset the facility NO_x emissions of 448.5 pounds per day and VOC emissions of 172.5 pounds per day. There are approximately 180 facilities in the San Joaquin District with banked NO_x emission reduction credits and 120 facilities with banked VOC emission reduction credits.

The emissions of SO_2, PM10, and CO were modeled as part of the application for the San Joaquin District's authority to construct and the resulting ambient concentrations were shown to be below the maximum allowable increments defined in the Clean Air Act. Additionally, these emissions were shown not to contribute to a violation of any NAAQS or California AAQS.

Because Mojave would install BACT and offset VOC and NO_x emissions; modelling of SO_2, PM10, and CO emissions showed no violation of any AAQS; and the San Joaquin District's NSR rule conforms with the SIP, the Famoso Compressor Station would not impose a significant impact on air quality.

Lindsay Compressor Station

Mojave would install two electric-motor-driven compressors and Caterpillar Clean Burn 3306, internal-combustion-engine-driven, backup generator at the Lindsay Compressor Station. The backup generator would only be run one hour per day and during electrical power outages.

The estimated Lindsay Compressor Station emissions are in table 5.10.1.5-1. Facility emissions would be minor because electric-motor-driven compressors would be used. The facility would emit 0.5 ton per year of NO_x (2.7 pounds per day) and 7.3 tons of VOCs per year (40.17 pounds per day) from the internal-combustion engine, compressor blowdown, and fugitive emissions. Because the emissions of NO_x and VOCs would exceed the San Joaquin District's NSR threshold of 2 pounds per day, the facility would be subject to NSR for each pollutant. The emissions of SO_2, PM10, and SO_4 would not exceed the NSR threshold of 550 pounds per day. Mojave would require an authority to construct permit from the San Joaquin District, but the application has not been submitted.

The San Joaquin District's NSR review thresholds would be exceeded, and BACT would be required for emissions of NO_x and VOCs. The generator's internal-combustion engine would use clean burn technology for BACT to minimize NO_x and VOC emissions.

Because Mojave would install an internal-combustion engine that meets BACT for NO_x and VOCs, the facility emissions would not exceed the San Joaquin District's NSR thresholds. Because the San Joaquin District's NSR rule conforms with the SIP, the Lindsay Compressor Station would not have a significant impact on air quality.

5.10.2 Noise

5.10.2.1 Criteria for Evaluating Impact and Determining Significance

The basis for evaluating noise impact is an L_{dn} of 55 dB(A), the level that protects the public from interference with indoor and outdoor activity in residential areas. Adverse impact on environmental noise levels is considered significant and would require additional mitigation if:

- Noise attributable to the operation of a proposed compressor station or new compressor units would exceed an L_{dn} of 55 dB(A) at nearby NSAs such as residences.
- Applicable state and local noise regulations would be exceeded.

5.10.2.2 General Impact and Mitigation

NSAs would experience increased noise levels during both construction and operation of the proposed facilities. Pipeline construction would proceed at 0.3 to 1.7 miles per day (see section 5.8.2). The open-trench phase of construction would last several weeks at any given location during which construction equipment would be operated on an as-needed basis. Although individuals in the immediate vicinity of the construction right-of-way would experience an increase in noise, the impact at any specific location would be temporary and limited to daylight hours.

Construction at compressor stations would take 8 months (see section 5.8.2). Although construction noise at the compressor station sites would occur over a longer period then noise from pipeline construction, the use of heavy construction equipment would be more sporadic. It would also be limited to daytime hours. Additional mitigation measures proposed by Mojave to reduce construction-related noise impact are proper equipment operating techniques and manufacturer-installed noise abatement equipment.

During the operational phase of the proposed project, the impact on the noise environment would be limited to the vicinity of the compressor stations. The principal noise sources at the stations would be the air inlet, exhaust, and casing of the engine or turbine for natural-gas-powered compressor stations and electric motors for electric-powered compressor stations. Secondary noise sources would be cooling fans, yard piping, and valves. Noise from relief valves, blowdown stacks, and emergency electrical generation equipment would be infrequent.

Mitigation measures Mojave would use for noise-generating equipment at compressor stations would be:

- Installing intake and exhaust silencers on the turbine-driven compressors.
- Housing the turbine-driven and electric-motor-driven compressor units in buildings.
- Installing acoustical insulation inside the buildings.
- Constructing exterior noise barrier walls.

5.10.2.3 Site-Specific Impact and Mitigation

Noise impact resulting from daytime construction activities would be more noticeable in nearby areas where people congregate during the day such as schools (see table 4.7.3-1), office and business parks, institutional facilities for the developmentally disabled (in Belmont at MP 9.1 on the Hunters Point Segment), convalescent care facilities (at MP 43.0 on the Palo Alto Segment), and residential areas. Construction should move as quickly as possible in these areas to minimize inconvenience.

Table 5.10.2.3-1 summarizes the locations of the nearest NSAs, the existing noise levels, and the noise estimated from the proposed compressor station equipment. In general, the noise impact of the proposed equipment was analyzed by Mojave's consultant, Woodward-Clyde Consultants, using the manufacturer's acoustic data.

Topock Compressor Station

The existing Topock Compressor Station consists of three Cooper Bessemer 8W330 reciprocating engines. Mojave proposes to add 24,470 hp of compression in a new, uninsulated, steel building.

A noise analysis of the proposed addition was done assuming two 12,235-hp Solar Mars T-14000 gas turbines with inlet and exhaust silencers, two lube oil coolers, and four gas cooling units would be operating at full capacity. The analysis was also done assuming that the turbine machinery casing would be unsilenced although a portion of this noise would be attenuated by the compressor building and that the lube oil cooler fans and gas cooling units would also be unsilenced. The predicted L_{dn} at the nearest NSA, approximately 5,280 feet southwest of the new compressor building, is 38 dB(A).

Table 5.10.2.3-1

Impact of Proposed Compressor Stations on Nearest Noise-Sensitive Areas (NSAs)

Compressor Station	Type of NSA	Distance and Direction from Compressor Station	Existing L_{dn} in dB(A) a/	Additional L_{dn} in dB(A)	Total L_{dn} in dB(A)	Noise Increase in dB(A)
Topock	Single-family residence	5,200 ft/SW	39	38	42 b/	3 c/
Amboy	Single-family residence	2,600 ft/SW	35 - 40	45	46	6 - 11
Daggett	Single-family	2,600 ft/NW	55	45	55	<1
Famoso	Single-family residence	3,300 ft/W	35 - 40	47	48	8 - 13
Lindsay	Single-family residence	500 ft/W	<60	55	<61	<1

---

a/ From table 4.10.2-1.

b/ The total noise level is a logarithmic sum of the existing noise level at the NSA and the calculated noise level at the NSA due to the operation of all major compression station equipment. For the Topock Compressor Station: Total $L_{dn} = 10 \log_{10} [10^{3.9} + 10^{3.8}] = 42$.

c/ The noise increase at the NSA is the difference between the total L_{dn} and the existing L_{dn}.

This combines with the existing L_{dn} of 39 dB(A) for a total L_{dn} at the nearest NSA of 42 dB(A), which is 3 dB(A) above the existing noise level. A 3-dB(A) increase is the threshold for the human ear perceiving a noticeable difference; however, the predicted impact of the proposed compressor additions is well below the L_{dn} limit of 55 dB(A). Table 5.10.2.3-1 summarizes the noise impact at the nearest NSA for the Topock Compressor Station and the other four compressor stations in the Mojave Northward Expansion Project.

Amboy Compressor Station

Mojave proposes to build the Amboy Compressor Station and install 21,254 hp of compression and a Caterpillar 3512 backup generator in separate, uninsulated, steel buildings. A noise analysis was done assuming that two 10,627-hp Solar Mars T-14000 gas turbines, the backup generator, and two gas cooling units would be operating at full capacity. The turbines and engine would have inlet and exhaust silencers. The analysis was also done assuming that the turbine machinery casing would be unsilenced although a portion of this noise would be attenuated by the compressor building and that the gas cooler units would also be unsilenced. The predicted L_{dn} at the nearest NSA, approximately 2,600 feet southwest of the proposed compressor building, is 45 dB(A). This combines with the existing L_{dn} of 40 dB(A), for a total L_{dn} at the nearest NSA of 46 dB(A), which is 6 dB(A) above the existing noise level. A 6-dB(A) increase would be noticeable; however, the predicted impact of the proposed compressor station is well below the L_{dn} limit of 55 dB(A).

Daggett Compressor Station

Mojave proposes to build the Daggett Compressor Station and install 31,500 hp of compression in an uninsulated, steel building. Mojave would also install three gas cooling units with four fans each outside the compressor building. A noise analysis was done assuming that three 10,500-hp electric motors and three gas cooling units would be operating at full capacity. The analysis was also done assuming that the motor and compressor machinery casing would be unsilenced although a portion of this noise would be attenuated by the compressor building and that the cooling fans would also be unsilenced. The predicted L_{dn} at the nearest NSA, approximately 2,600 feet northwest of the proposed compressor building, is 45 dB(A). This combines with the existing L_{dn} of about 55 dB(A) for a total L_{dn} at the nearest NSA of still only about 55 dB(A) so there would be no perceivable difference to the human ear.

Famoso Compressor Station

Mojave proposes to build the Famoso Compressor Station and install 20,330 hp of compression and a Caterpillar 3512 backup generator in separate, uninsulated, steel buildings. A noise analysis was done assuming that two 10,165-hp Solar Mars T-14000 gas turbines, the backup generator, and two gas cooling units would be operating at full capacity. The turbines and engine would have inlet and exhaust silencers. The analysis was done assuming that the turbine machinery casing would be unsilenced although a portion of this noise would be attenuated by the compressor building and that the gas cooler units would also be unsilenced. The predicted L_{dn} at the nearest NSA, approximately 3,300 feet west of the proposed compressor building, is 47 dB(A). This combines with the existing L_{dn} of 40 dB(A) for a total L_{dn} at the nearest NSA of 48 dB(A), which is 8 dB(A) above the existing noise level and a perceivable difference to the human ear. The predicted impact is still well below the L_{dn} limit of 55 dB(A).

Lindsay Compressor Station

Mojave proposes to build the Lindsay Compressor Station and install 26,000 hp of compression and a Caterpillar 3306 emergency electrical generator in separate, uninsulated, steel buildings. Mojave would also install two gas cooling units with four fans each outside the compressor building. A noise analysis was done assuming that two 13,000-hp electric motors, the emergency generator, and two gas cooling units would be operating at full capacity. The analysis was done assuming that the motor and compressor machinery casing would be unsilenced although a portion of this noise would be attenuated by the compressor building and that gas cooling units would also be unsilenced. The predicted L_{dn} at the nearest NSA, approximately 500 feet west of the proposed compressor building, is 55 dB(A). This combines with the existing L_{dn} of 60 dB(A) for a total L_{dn} at the nearest NSA of 61 dB(A), which is only 1 dB(A) above the existing noise level and barely perceptible to the human ear. Nevertheless, because the predicted noise level at nearby NSAs is an L_{dn} of 55 dB(A):

- **We recommend that Mojave conduct and file a noise survey with the FERC and SLC no later than 60 days after placing the Lindsay Compressor Station in service. If the noise attributable to the operation of this station at full load exceeds the L_{dn} limit of 55 dB(A) at any nearby NSAs, Mojave should install additional noise controls to meet that limit within 1 year of the in-service date. Mojave should confirm compliance with the L_{dn} limit of 55 dB(A) by filing a second noise survey with the FERC and SLC no later than 60 days after installing the additional noise controls.**

5.11 RELIABILITY AND SAFETY

The transport of natural gas by pipeline involves some risk to the public in the event of an accident and subsequent release of natural gas, which can ignite or explode; however, historical data show that pipeline accidents are rare. About 80 percent of the proposed pipeline would be constructed in existing rights-of-way including about 43 percent within railroad rights-of-way. A recent California State Fire Marshall (CSFM) study of hazardous liquid and natural gas pipelines in railroad rights-of-way found no correlation between proximity to a rail line and pipeline accidents (CSFM, 1993). As shown in table 4.7.1.1-3, the proposed route of the core project is within 50 feet of residences at 136 locations. The additional pipeline to serve Alternative Customer Groups 1 and 2 would be within 50 feet of residences at 26 and 25 locations, respectively. In residential areas, the pipeline would be either under streets or railroad rights-of-way. As shown in table 4.7.3-1, the areas of public interest crossed by or near the proposed pipeline route include nine schools and six intensively used recreation centers where large numbers of people may be present during special events.

The primary component of natural gas is methane, which is colorless, odorless, and tasteless. Although not chemically toxic, it is classified as a simple asphyxiant with a slight inhalation hazard. Exposure to high concentrations can result in serious injury or death due to oxygen deficiency. Methane has an ignition temperature of 1,000°F and reacts violently with bromine and chlorine in sunlight. The specific gravity of methane in air is 0.55, meaning it is lighter than air and rises at normal atmospheric temperatures, dispersing rapidly. In general, unconfined mixtures of methane in air are not flammable or explosive because they are too dilute; i.e., at less than 5 percent methane by volume, the mixture is too "lean" to burn. Mixtures of methane in air are flammable or explosive at 5 to 15 percent methane by volume, but, above 15 percent methane, the mixture is too "rich" to burn.

5.11.1 Safety Standards

The proposed facilities would be designed, constructed, operated, and maintained in accordance with the DOT Minimum Federal Safety Standards in Title 49, CFR, Part 192, which are intended to ensure adequate protection for the public from natural gas facility failures. Part 192 specifies material selection and qualification, minimum design requirements, and protection from internal, external, and atmospheric corrosion. Part 192 also defines area classifications on the basis of population density in the vicinity of the pipeline, which determine more rigorous safety requirements for populated areas. The class location unit is based on an area that extends 220 yards on either side of the centerline of any continuous 1-mile length of pipeline. The four area classifications are defined as follows:

- Class 1 — Location with 10 or fewer buildings intended for human occupancy.
- Class 2 — Location with more than 10 but less than 46 buildings intended for human occupancy.
- Class 3 — Location with 46 or more buildings intended for human occupancy or where the pipeline lies within 100 yards of any building or small, well-defined outside area occupied by 20 or more people during normal use.
- Class 4 — Location where buildings with four or more stories aboveground are prevalent.

Class locations representing more populated areas require higher safety factors in pipeline design, testing, and operation. Pipelines constructed in Class 1 locations must be installed with a minimum depth of cover of 30 inches in normal soil and 18 inches in consolidated rock. Class 2, 3, and 4 locations as well as drainage ditches along public roads and railroad crossings require a minimum cover of 36 inches in normal soil and 24 inches in consolidated rock. Class locations also specify the maximum distance from any point on the pipeline to a sectionalizing block valve (e.g., 10.0 miles in Class 1, 7.5 miles in Class 2, 4.0 miles in Class 3, and 2.5 miles in Class 4). Pipeline design pressures, hydrostatic test pressures, maximum allowable operating pressures, inspection and testing of welds, and frequency of pipeline patrols and leak surveys must also conform to higher standards in more populated areas. There are Class 1, 2, and 3 locations in the vicinity of the proposed route.

Part 192 prescribes the minimum standards for operating and maintaining natural gas facilities and requires a written plan governing these activities. These regulations were recently amended to require that natural gas pipeline operators include detailed procedures regarding normal and abnormal operation, maintenance, and emergency-response activities in their O&M manual, which must be updated annually. Mojave would be required to amend its existing O&M manual to comply with the regulations when they take effect on February 11, 1995. Under Section 192.615, each operator must also establish an emergency plan that includes procedures to minimize the hazards in an emergency. Key elements of the plan include procedures for:

- Receiving, identifying, and classifying emergency events including gas leaks, fires, explosions, and natural disasters.
- Establishing and maintaining communications with local fire, police, and public officials and coordinating emergency responses.
- Making personnel, equipment, tools, and materials available at the scene of an emergency.
- Protecting people first and then property and making them safe from actual or potential hazards.
- Emergency shutdown of the system and safe restoration of service.

Each operator must establish and maintain liaison with appropriate fire, police, and public officials to learn the resources and responsibilities of each organization that may respond to a gas pipeline emergency and to coordinate mutual assistance. The operator must also establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a gas pipeline emergency and report it to appropriate public officials.

5.11.2 Pipeline Incident Rates

Since February 9, 1970, regulations contained in Title 49, CFR, Part 191, have required all operators of natural gas transmission systems to notify the DOT of any reportable incident and to submit a report using Form F7100.2 within 20 days. Since June 1984, a reportable incident has been defined by the DOT as any release that:

- Involves a release of gas and either causes a death or personal injury requiring in-patient hospitalization or causes estimated damage to the property of the operator or others or both totalling at least $50,000 including the cost of lost gas.

- Is significant in the judgement of the operator even though it does not meet the above criterion.

The report criteria were broader in scope prior to 1984, and reportable incidents also included any release that:

- Requires taking any segment of transmission line out of service.

- Results in gas ignition.

- Causes estimated damage to the property of the operator or others or both totalling at least $5,000.

- Requires repairing the transmission line immediately.

- Occurs while testing with gas or another medium.

Table 5.11.2-1 summarizes the available historical incident, injury, and fatality rates for natural gas pipelines. The data were drawn from a DOT summary of analyses of natural gas pipeline incidents and the CSFM's risk assessment of hazardous liquid and natural gas pipelines, which was prompted when a 1989 train derailment in San Bernardino ruptured a gasoline pipeline (American Gas Association, 1986, 1992; CSFM, 1993; DOT, 1994). As of the date of publication of this EIR/EIS, Mojave has had no reportable incidents.

On the basis of the available data and approximately 311,000 miles of natural gas transmission and gathering lines in service nationwide, the public fatality rate for 1970-1984 was 0.008 per 1,000 miles of pipeline per year (mi-yr). The proposed facilities would therefore be expected to only cause a negligible increase in risk to the public, especially in light of safety factors required by the DOT Minimum Federal Safety Standards imposed since 1984. This estimate is considered to be an upper limit because it is based on historical data for older pipelines installed and operated under less stringent requirements than those for new pipelines. The Mojave Northward Expansion Project would be a continuous pipeline installed using high-grade piping, an epoxy exterior coating, a cathodic protection system, and an automatic leak detection system backed by scheduled visual and smart pig surveys (see section 2.5).

The total average incident and injury rates for 1970 through 1984 were significantly higher than for 1984 through 1993 in part because of the narrowing of the pipeline incident reporting criteria in 1984. Although impossible to verify with the available data, the rates were also probably reduced as a result of the implementation of the One-Call program in 1982. The One-Call program is a service used by public utilities and some private companies including pipeline and cable television operators to provide preconstruction information on the underground location of pipes, cables, and culverts to contractors and maintenance crews. Intended to reduce incidents caused by third-party digging near pipelines and other utilities, the One-Call program allows anyone planning to excavate to call a single number to alert all utilities.

TABLE 5.11.2-1

Historical Incident, Injury, and Fatality Rates for Natural Gas Pipelines

	Rate per 1,000 Miles of Pipeline Per Year (mi-yr) a/		
	1/70 - 6/84 (CSFM, 1993)	7/84 - 12/88 (CSFM, 1993)	1/85 - 12/93 (DOT, 1994) a/
Total average incident rate	1.32	0.27	0.30
Total injury rate b/	0.096	0.062	0.055
Nonemployee injury rate	0.026 c/	NA	NA
Total fatality rate	0.016	0.015	0.015
Nonemployee fatality rate	0.008 c/	NA	NA

---

a/ Rates are based on 311,000 total miles of natural gas pipelines nationwide.
b/ Injuries requiring in-patient hospitalizaion.
c/ 161 of a total of 275 injuries and 36 of a total of 72 fatalities were to employees of the operating company; nonemployee injury and fatality rates assume 311,000 total miles of natural gas pipelines.
NA = Not available; employee/nonemployee breakdown not available after 1983.

TABLE 5.11.2-2

Nationwide Accidental Deaths

Type of Accident	Fatalities a/
Motor vehicle	46,000
Fall	11,600
Drowning	5,700
Poisoning	5,200
Fire and burn	4,800
Suffocation by ingested object	3,100
Tornado, flood, earthquake, etc. (1978-87 avg.) b/	132
Lightning (1980-82 avg.)	94
Liquid or gas pipeline (1978-87 avg) b/	27
Gas transmission or gathering line, nonemployee (1970-84 average) c/	2.6
TOTAL	92,000

---

a/ Unless otherwise noted, the data are 1984 (National Safety Council, 1985).
b/ DOT, 1988.
c/ American Gas Association, 1986.

Additional insight into the nature of service incidents may be found by examining the primary factors that caused the failures. The table below provides a percentage distribution of the causal factors as well as the annual frequency of each factor per 1,000 miles of pipeline in service.

Cause	Percentage	Incidents/1,000 mi-yr
Outside forces	53.5	0.70
Corrosion	16.6	0.22
Material defect	16.9	0.21
Construction defect	4.8	0.06
Other	8.2	0.11
TOTAL	100.0	1.30

The table shows an average annual service incident frequency of 1.30 failures per 1,000 miles per year for all natural gas transmission and gathering lines. The pipelines included in the data set varied widely in terms of age, diameter, and level of corrosion control. Each variable influences the incident frequency that may be expected for a specific segment of pipeline. The frequency of service incidents is strongly dependent on pipeline age. While pipelines installed since 1950 exhibit a fairly constant frequency of service incidents, older pipelines have significantly higher frequencies, partially due to corrosion, which is a time-dependent process. New pipelines generally have more advanced coatings and cathodic protection to reduce corrosion potential.

The dominant incident cause is outside forces, constituting 53.5 percent of all service incidents. Outside forces incidents result from the encroachment of mechanical equipment such as bulldozers and backhoes, from earth movements due to soil settlement, washouts, or geologic hazards, from weather effects such as winds, storms, and thermal strains, and from willful damage. The breakdown of outside forces incidents in the table below shows that human error in equipment usage was responsible for approximately 75 percent of outside forces incidents.

Cause	Percentage
Equipment operated by outside party	67.1
Equipment operated by or for pipeline operator	7.3
Earth movement	13.3
Weather	10.8
Other	1.5

Older pipelines have a higher frequency of outside forces incidents partly because their locations may be less well-known and less well-marked than the locations of newer pipelines. In addition, older pipeline systems contain disproportionate numbers of smaller-diameter pipelines, which have greater rates of outside forces incidents because they are more easily crushed or broken by mechanical equipment or earth movements.

The table below clearly demonstrates the effectiveness of corrosion control in reducing the incidence of failures caused by external corrosion. The use of both an external protective coating and a cathodic protection system, required on all pipelines installed after July 1971, significantly reduces the rate of failure compared to unprotected or partially protected pipe. The data show that bare, cathodically protected pipe actually has a higher corrosion rate than unprotected pipe. This anomaly reflects the retrofitting of cathodic protection to actively corroding spots on pipes.

Corrosion Control	Incidents/1,000 mi-yr
None (bare pipe)	0.42
Cathodic protection only	0.97
Coated only	0.40
Coated and cathodic protection	0.11

The nationwide totals of accidental fatalities caused by various manmade and natural hazards are listed in table 5.11.2-2 in order to provide a relative measure of the industry-wide safety of natural gas pipelines. Direct comparisons between accident categories should be made cautiously since individual exposures to hazards are not uniform among all categories. Nevertheless, the average 2.6 public fatalities per year is relatively small considering the more than 300,000 miles of transmission and gathering lines in service nationwide. Furthermore, the fatality rate is approximately two orders of magnitude lower than the rates of fatalities from natural hazards such as lightning, tornados, floods, and earthquakes.

5.11.3 Pipeline Safety Features

Table 5.11.3-1 compares the factors influencing the risk of an incident for any pipeline with safety features incorporated in the proposed project. The proposed project would be designed, constructed, operated, and maintained in accordance with the DOT Minimum Federal Safety Standards (49 CFR 192), which were described above.

The pipeline would be operated in accordance with applicable Federal and state occupational safety and health regulations including specific requirements for confined space entry, fire prevention, evacuation, hazard communication, hazardous materials emergency response, and personal protective equipment. Mojave's existing O&M program would be expanded to cover the proposed project. Mojave also has an existing pipeline damage control program that includes corrosion control and leak surveys and that would be expanded to cover the proposed project. Mojave would mark the locations of its underground facilities, continue to participate in the One-Call program, and provide onsite inspection of construction activities that could impact the pipeline.

All pipeline block valves in heavily populated areas would be fitted with automatic line-break control devices, which would shut off the supply of gas if the pipeline were punctured or broken. All control valves at meter stations and block valves in critical locations could be closed remotely by personnel at the Gas Control Center where pressure and volume changes would be detected. The Gas Control Center would be manned 24 hours per day, seven days per week. The control system would include redundant control computers, redundant power supplies, and redundant communication links to the meter stations. A relational database would store real-time flow, pressure, and temperature measurements and provide on-line reports or responses to queries by pipeline operators. When the measured pressures deviate from computer-predicted pressures, the operator would receive an alarm. Every meter station would have redundant power supplies and redundant communication links to the Gas Control Center in Bakersfield.

TABLE 5.11.3-1

Comparison of Factors in Historic Pipeline Incidents with Mojave Northward Expansion Project Safety Features

Factor	General Finding	Mojave Northward Expansion
One-Call System	Reduces incidents due to third-party damage.	Mojave participates in the One-Call program. Aboveground signs warning of the pipeline would be posted so each sign can be seen from the next sign on either side (Class 2 and 3 locations) and placed at each roadway, rail, canal, pipe, and cable crossing (Class 1 locations).
Railroad Effect	The 1993 CSFM study found no correlation between proximity to a rail line and any increased incidence of hazardous-liquid pipeline leaks.	Mojave would meet the railroads' requirements and specific safety or design concerns.
Standard Metropolitan Statistical Areas (SMSAs)	The 1993 CSFM study found that hazardous-liquid pipelines in SMSAs had incident rates three times higher than pipelines outside SMSAs, 7.84 versus 2.49 incidents/1,000 mi-yr. The major influence on this difference appeared to be much higher external corrosion rates than piping outside urban areas, possibly due to more frequent interruption of the cathodic protection system, inaccessibility of pipelines buried under streets for close interval surveys, and high costs and permit problems associated with replacing pipe sections in urban areas. In addition, higher rates of third-party damage were noted for pipelines in urban areas.	Mojave would meet with local emergency response organizations in urban areas to regarding emergency response capabilities and Mojave's emergency response plan. The of use "smart pigs" would allow internal inspection of pipeline buried under streets.
Piping Age	Pipelines installed since 1950 have exhibited a fairly constant level of service incident frequency. Older pipelines have a higher frequency of corrosion incidents because corrosion is a time-dependent process. New pipe generally uses more advanced coatings and cathodic protection to reduce corrosion potential.	The project would install all new pipe. Failure rates may increase as the pipeline ages but would be lower than those of the current pipeline stock because of better materials used in construction and cathodic protection provided at installation.
Piping Diameter	There is a wide variance in data but generally higher incident rates for smaller-diameter piping, which is more easily crushed or broken by mechanical equipment, resulting in a higher rate of releases. Larger pipe diameters are associated with higher leak rates.	The proposed project would consist of 270.2 to 321.9 miles of 30-inch-diameter pipe for the mainlines and loops with the remainder of the system comprised of 20" (20.5-50.2 mi), 12" (139.0-149.9 mi), 10" (74.7-78.5 mi), 6" (20.1-45.0 mi), and 4" (21.6-34.5 mi) diameter pipes. Pipeline cover would be 5 feet for the 30-inch-diameter North Mainline from MP 0 to MP 214 and would meet or exceed the requirements in 49 CFR 192.327 in all other locations.
Leak Detection Systems	The 1993 CSFM study could not confirm or refute that installation of a supervisory control and data acquisition (SCADA) system reduces pipeline incidents.	Mojave would install a SCADA system with input sensors at all supply and delivery points and would monitor the position of all isolation valves. Isolation valves would automatically close if the pressure drop rate in the line were to exceed an operational setpoint, which would limit leaks, and a valve position alarm would notify operators of the problem). The pipeline right-of-way would be visually inspected monthly.
Corrosion Control	The 1993 CSFM study noted a major reduction (by a factor of 4 or 5) in incidents when coatings and cathodic protection were provided.	The piping would have protective coatings and cathodic protection.
Pipe Specifications	The 1993 CSFM study reported incident rates of 4.13, 11.05, and 57.36 incidents/1,000 mi-yr for regulated hazardous-liquid piping constructed of ASTM X grade material, ASTM A53 and Grade B material, and "other" materials, respectively.	Mojave would use piping that meets API specifications for high-test line pipe (API-5LX70) and that meets ANSI B31.4 and B31.8 requirements along railroad rights-of-way.

TABLE 5.11.3-1 (cont'd)

Factor	General Finding	Mojave Northward Expansion
Operating Pressure	The 1993 CSFM study found no statistically significant relationship between piping operating pressure and incident rates although higher pressures and pipe diameters were associated with higher leak rates and total spill volumes.	The maximum allowable operating pressures would be 700 to 1,200 pounds per square inch gauge (psig).
External Piping Coatings	The 1993 CSFM study reported lower incident rates for pipe with external coatings compared with bare pipe.	Mojave would use externally mill- or yard-coated pipe with a fusion-bonded epoxy coating. The incident rate reported for this type of coating (7.41 incidents/1,000 mi-yr) is about midway between the worst reported (bare pipe at 17.35 incidents/1,000 mi-yr) and the best reported (extruded polyethylene with side-extruded butyl at 0.53 incidents/1,000 mi-yr).
Internal Inspections	Piggable systems have the lowest incident rates.	The pipeline would be designed for multipurpose pigging, i.e., for cleaning and inspection with "smart pigs."
Seasonal Effects	The 1993 CSFM study reported that most leak causes occurred randomly throughout the year except for third-party damage from farm equipment (no reports from April through August during the 10-year study period). The study also noted that the overall leak rate was lowest from April through June.	Providing 5 feet of cover above the pipeline would reduce the likelihood of third-party damage during plowing season.
Leaking Components	Leak causes are leaking pipe body (87%), leaking valves (3.1%), longitudinal seam weld failures in the pipe body (2%), leaks at welded fittings (1.6%), and other causes (6.7%).	Mojave would radiographically inspect 100 percent of the welds during construction and would use "smart pigs" for internal system inspection during operation.
Seismic Activity	Damage to segmented pipelines (e.g, bell and spigot, flange, joined cast iron, or asbestos cement) is much more common than damage to continuous pipelines (e.g., full-penetration welded steel). Three out of 500 pipeline leaks reported in 1981-90 were attributed to earthquakes.	The Mojave project would be a continuous pipeline. It would be routed through active seismic areas. The Geologic Hazards Study identifies specific mitigation incorporated at crossings of active faults.

Mojave's O&M personnel have been and would continue to be trained in leak detection and emergency shutdown and blowoff procedures to stop the flow of gas and reduce line pressure in an emergency. Mojave's existing emergency plan would be updated to cover the proposed project. Mojave maintains 24-hour emergency response capabilities and will accept collect calls to its emergency-only phone number, which is manned 24 hours a day. The number is posted on all pipeline markers and provided to all local emergency services agencies. Mojave would meet with these agencies before the proposed project begins operation and would provide a written description of the system. Mojave would also meet with all local emergency service agencies on an annual basis. Mojave has estimated the worst-case response time of its personnel at 60 to 90 minutes in the event of multiple emergencies such as two emergencies in the same area.

If local fire departments require additional training or special equipment because of the proposed project, Mojave would assist and coordinate the additional training and identification of vendors of special equipment. Fire departments would need special training with regards to:

- Characteristics and properties of natural gas.
- Managing emergencies dealing with high pressure natural gas leaks at low or high volumes.
- Exact location of the pipeline through each community.
- Familiarization with pipe depth and size, pressure, and valving locations and types.
- Operation of valves during normal operations as well as in an emergency.
- Coordination with Mojave operating personnel during an emergency in conformance with Mojave's Pipeline Emergency Plan and emergency operating procedures.
- Pipeline marker guidelines and rules.
- Emergency evacuation plans and procedures.

Fire departments would need the following equipment:

- Natural gas detectors or combustible gas indicators.
- Pipeline detection devices.
- Computer link to Under Ground Service Alert (call before you dig).

5.11.4 Contaminated Soil and Groundwater

As discussed in sections 5.2 and 5.3, contaminated soils and groundwater may be encountered at various locations along the proposed pipeline route. Mojave has prepared a General Contingency Plan for all areas where there is a reasonable potential for contamination including areas where contaminated sites have been identified within shallow groundwater zones or within a 400-foot-wide corridor along the route. The General Contingency Plan identifies measures and precautions to take should stained soils be observed or odorous conditions detected during construction activities. If soil or groundwater contamination is encountered or suspected, the construction crew would stop work, move away from the area, and follow the Contractor's Health and Safety Plan, which would comply with the personnel protection requirements of Title 29, CFR, Section 1910.120. Personnel trained and equipped for the handling of petroleum-contaminated soils would excavate and stockpile the contaminated soil. Representative samples from the stockpiled materials would be analyzed by trained and equipped personnel for petroleum contaminants including total petroleum hydrocarbons, benzene, toluene, ethylbenzene, and xylene.

By letter dated October 19, 1994, the California Environmental Protection Agency's Department of Toxic Substances Control (DTSC) notified Mojave that it would permit the return of contaminated soil to the trench under the following conditions:

- Mojave would implement appropriate health and safety precautions to protect its employees and the public and to prevent or minimize any exposure to potentially hazardous substances.
- Mojave would determine the nature of the contaminant and assess the compatibility of the contaminant with the facilities being installed; Mojave would not install facilities in an area with incompatible contaminants.
- Excavated soils would be returned to the original excavation whenever possible.
- Excavated soils would be deposited so that only clean soil would be exposed at the surface of the filled excavation.
- All displaced soil, i.e., soil that could not be placed back into the excavation, would be assessed to determine whether it exhibits a characteristic specified in Title 22, California Code of Regulations, Chapter 11.
- If the displaced soil is determined to be a hazardous waste, it would be managed in accordance with all applicable Federal and state hazardous waste laws and regulations.
- Excavated soil not replaced in the excavation by the end of the day would be covered with visqueen to prevent potential migration of contamination due to storm runoff.
- Contaminated soil would not be moved outside the area of contamination.

In addition to the conditions that Mojave has agreed to meet when returning contaminated soil to its original location, DTSC would require that Mojave provide written notification, all test results, and the location of the contaminated soil to the landowner as well as DTSC. If it is determined that the contaminated soil is a threat or potential threat to public health or the environment, DTSC could require Mojave to take further action to remediate the contamination. Some cities or counties could impose additional requirements as permitted by local ordinance.

Any excess contaminated soil that could not be returned to the trench would need to be disposed at an approved treatment or disposal facility. Other options would include excavating and disposing contaminated soil offsite, aerating it on- or offsite, if permitted, to remove any volatile organic contaminants from the soil and rerouting the pipeline to avoid a potentially contaminated area. Mojave would pump and treat any contaminated groundwater and discharge the treated water to the sanitary sewer or storm drain with appropriate permits or would make other arrangements.

All equipment that contacted potentially contaminated soil would be decontaminated by steamcleaning before leaving the site, and the decontamination condensate/washwater would be properly disposed. Mojave's General Contingency Plan states that water would not be applied to control dust because stopping work would eliminate dust formation unless the wind were blowing. Because high winds frequently occur in areas of potential contamination such as along the Hunters Point Segment, merely stopping work would not be adequate to prevent the migration of contaminated dust, especially if the right-of-way had been cleared.

- **We, therefore, recommend that Mojave treat soil suspected of being contaminated in accordance with the DTSC requirements for contaminated soils until the required soil analysis is complete. 1/**

- **Mojave should consult with the appropriate Federal, state, or local agencies to determine which known or suspected contaminated sites require further investigation and what mitigation may be employed to minimize impact in the event that contaminated areas are crossed. Any abandoned hazardous waste materials discovered during construction should not be disturbed and should be promptly reported to the respective state authorities or the EPA.**

1/ The FERC and SLC staffs will recommend to their respective Commissions that their additional mitigation measures (offset in boldface type in the text) be included as specific conditions to any approving Certificate issued for Mojave's project. The staffs will also recommend that Mojave be required to implement the mitigation measures that Mojave has proposed as part of the project unless specifically modified by other Certificate conditions.

5.12 CUMULATIVE IMPACT

Cumulative impact occurs when the effects of two or more individual, closely related, past, present, or reasonably foreseeable future projects compound to cause or increase environmental effects even through the impact of any one project may not be significant by itself. In order to identify projects that are closely related to Mojave's proposed project in location, type, size, and schedule, we obtained a list of projects in the affected counties for which EIRs have been prepared since 1990 from the State Clearinghouse Data Base, which contains information on all EIRs prepared within California regardless of the agency with jurisdiction. We reviewed the list of 220 projects and added others not in the database but which are known to be occurring near the proposed project within the same timeframe. We then eliminated those projects that have already been completed, that did not involve construction such as rezoning or general plan amendments, or that were obviously too far from the proposed project to cause a cumulative effect.

Two energy-related projects are directly linked to Mojave's project because they would receive natural gas through the proposed project in order to produce electricity. Both projects have included Mojave's proposed project in their environmental analyses. A brief description of each project is presented below.

Sacramento Municipal Utility District (SMUD) Cogeneration Pipeline Project (Sacramento and Yolo Counties) — SMUD proposes to construct and operate a 64-mile-long, 20-inch-diameter pipeline to transport natural gas to four SMUD cogeneration power plants. The pipeline would connect with existing PG&E Gas Lines 400 and 401, allowing SMUD to purchase natural gas from Canada. In addition, SMUD would connect with Mojave's proposed project in order to purchase natural gas from the Southwest and Rocky Mountain areas. The connect to the Sacramento Segment of Mojave's Northward Expansion is proposed at the Carson Ice Cogeneration Plant located at the Sacramento Regional Wastewater Treatment Plant. The proposed start date for construction of the SMUD Cogeneration Pipeline Project was November 1994; however, construction has yet to begin. The proposed start date for operation is between December 1995 and June 1996.

Hunters Point Power Plant (City and County of San Francisco) — San Francisco Energy Company proposes to construct a 240-megawatt electrical generating plant near the end of the Hunters Point Segment of Mojave's proposed project. Mojave could supply natural gas to fuel the turbines at the plant. Of the several proposed plant locations, the preferred location is on Innes Avenue and the first alternative site is on Port of San Francisco land along the south side of Islais Creek Channel. The proposed completion date for the power plant is 1997.

The remaining 50 projects were plotted on maps, compared with the proposed project, and evaluated further. The projects with the potential to cause cumulative impact include construction projects that are close to the proposed project and could occur within the same timeframe. In general, the construction of single buildings and projects more than 1 mile from the proposed project were eliminated from further consideration. Linear projects such as transit route construction, even if more than 1 mile from the proposed project, were given greater consideration because their overall impact would generally be more similar to that of the proposed project. The remaining projects are in 10 counties throughout California; and are summarized below.

East Bay BART Expansion (Alameda and Contra Costa County) — This project is under construction to extend BART service from the Bay Fair Station in San Leandro to Dublin and Pleasanton beginning operation in 1996. In the future, this line will be extended along the I-580 corridor to a point near Vasco Road in East Livermore. In Contra Costa County, BART will be extended from

Concord to Bailey Road in Baypoint (formerly West Pittsburg) with completion scheduled for 1997. Longer-range plans include further extension to a station at Somerville Road in Antioch and a BART maintenance yard along the SP railroad tracks east of Hillcrest Road in Antioch.

State Route 4 Bypass Project/East County Corridor Program (Contra Costa and Alameda Counties) — The East County Corridor is a future 30-mile-long transportation corridor between Livermore in Alameda County and Antioch in Contra Costa County. Its northern 9.3 miles would be the future State Route 4 Bypass (formerly the Delta Expressway), which will proceed southward from the juncture of State Route 4 and State Route 160, bypass Oakley and Brentwood, and connect with the northern relocated Vasco Road at Walnut Boulevard near Los Maganos. Marsh Creek Road will be upgraded to a connect State Route 4 and the bypass. Although construction on Phase I of the bypass project is scheduled to begin in 1997 or 1998 and to be completed in 2000 with Phase II completed in 2010, we included the project because of its scope and location (Tunison, 1994, personal communication). A draft EIR was published in 1993, and certification hearing was scheduled for November 1994 with issuance of the final EIR to follow (Environmental Science Associates, 1993).

Mid-State Toll Road Construction (Contra Costa and Alameda Counties) — This project is in the very early planning stages. Although no funding is currently available, scoping meetings to determine the issues to be considered in environmental review documents were held in June 1994. The general route parallels State Route 4 near Antioch, proceeds east, and turns south toward Livermore. Between Pleasanton and Livermore, it would bypass the I-680/580 interchange. No schedule for decision-making or construction has been established.

Los Vaqueros Reservoir/Utility Relocation (Contra Costa County) — This project including construction of a reservoir and water conveyance facilities and the relocation of Vasco Road and a utility corridor was discussed in section 3. The utility relocation construction is planned for 1995.

Benicia-Martinez Bridge System Improvement Study (Contra Costa and Solano Counties) — This project would involve the construction of a new toll bridge across the Carquinez Strait parallel to the Benicia-Martinez bridge, relocation of the toll plaza, and widening of I-680 and I-780.

Bond Road Widening (Sacramento County) — This project would widen Bond Road in Elk Grove from two to four lanes. It would also include the widening of the bridge over Laguna Creek.

U.S. Highway 101 Interchange/Third and Fourth Avenue Intersection Upgrades (San Mateo County) — This project would widen the East Third Avenue overcrossing of U.S. Highway 101 from four to six lanes and upgrade intersections at Norfolk Street and Third and Fourth Avenues between Humboldt and South El Dorado Streets in San Mateo.

Vintage Oaks (San Mateo County) — This is a 46-acre housing subdivision at Middlefield Road and Santa Monica Avenue in Menlo Park.

One Davey Glen Road Condominiums (San Mateo County) — This is an 86-unit residential condominium project in Belmont.

Vasco Road Landfill Expansion (Alameda County) — This project would expand the existing sanitary landfill at Vasco Road and Dalton north of Livermore to 86 acres.

Newark Subbasin Sewer Correction Program (Alameda County) — This is a capital correction program for five sewer corridors in Newark.

Transportation Corridor in City of Fresno (Madera County) — This would be a new freeway and expressway project from Chestnut to Highland Avenue in Fresno.

49 MW Steam-Injected Gas Turbine Project (Stanislaus County) — This 49-megawatt project is under construction to increase the generating capacity at Crows Landing and Service Road in Ceres.

Mountain House New Town (San Joaquin County) — This project at I-205 and Patterson Pass near Tracy is a new 4,667-acre town with a 20-year buildout population of 35,585.

Materials Recovery Facility (Fresno County) — This project is a materials recovery facility with a maximum capacity of 850 tons of mixed solid waste per day. It is at 24-1/2 Avenue and Road 16 in Chowchilla.

New High School Acquisition and Development, Turlock (Stanislaus County) — This is a 60- to 105-acre acquisition for development of a high school at the northeast corner of North Mountain View and Christoffer in Turlock.

Shell Oil Company Hazardous Waste Storage/Incinerator Facility (Contra Costa County) — This project includes installation of two storage tanks and four incinerators for destruction of onsite-generated hazardous waste at the refinery at Marina Vista and Shell Avenue in Martinez.

BART to Extension to San Francisco International Airport (San Mateo County) — This project includes the proposed extension of the BART service from Colma to the vicinity of the airport.

Rail/Cycle (San Bernardino County) — This project involves the rail transport of municipal solid waste and the construction of municipal solid waste landfill near Amboy northeast of Bristol Dry Lake.

Although we have identified the tentative construction schedule where possible, the actual construction schedules for many of these projects will depend on factors such as economic conditions, the availability of funds, and political considerations. In general, while coordinating construction schedules could reduce traffic interruptions and other nuisances, we do not believe that the cumulative impact would be significant where construction would occur in limited locations in urban areas as with the Bond Road Widening, U.S. Highway 101 Interchange/Third and Fourth Avenue Intersection Upgrades, Vintage Oaks, One Davey Glen Road Condominiums, and New High School Acquisition and Development in Turlock. While these projects in combination with the proposed project could adversely affect air quality, the existing air regulatory programs are designed to address this potential effect.

The most significant potential for cumulative impact exists in eastern Alameda and Contra Costa Counties where several linear projects and very large developments could potentially exert additional pressure on sensitive wildlife species. Although all of the projects would mitigate this effect by compensation, the residual cumulative impact on special-status species could be significant. The Los Vaqueros Reservoir and associated Vasco Road/utility corridor relocation, the State Route 4 Bypass/East County Corridor Program, the Vasco Road Landfill Expansion,and the Mid-State Toll Road are all proposed projects that could affect the same geographic area. According to its proposed schedule, the Los Vaqueros utility corridor relocation construction would occur at about the same time as Mojave's proposed project. It may be beneficial to have the disturbance occur at the same time.

The highway programs are at various stages of planning and would likely be constructed a number of years after Mojave's proposed project as would the Los Vaqueros Reservoir. Because Mojave's project would result in temporary disturbance of the right-of-way except in wooded areas where a 10-foot-wide permanent right-of-way would be maintained, the impact would be much less than for a highway where habitat is permanently removed. These projects remain somewhat speculative in terms of their implementation and project schedules,and it is not possible to specify whether the impact would be significant.

5.13 GROWTH-INDUCING IMPACT OF THE PROPOSAL ACTION

During the scoping process, several commentors cited the economic benefits to the state of the proposed project in terms of construction employment, purchases of goods and services, and taxes paid. Permanent new employment would, however, be small and would not stimulate new population growth or associated new housing construction.

The proposed project would provide an alternative supply of natural gas, a cleaner-burning fossil fuel, to large industrial customers, some of which would be newly constructed, permitted electrical cogeneration or other facilities. While the availability of an alternative source of natural gas may be a contributing factor in stimulating economic and population growth, any determination as to the location and magnitude of such growth is premature and speculative at this time.

6.0 COMPARISON OF THE ALTERNATIVES TO THE PROPOSED PROJECT

As discussed in section 3.2, we did not identify any system alternatives that could meet Mojave's project objective of providing competition to the existing delivery system. We were unable to identify an alternative route in the Mojave Desert that could offer a significant advantage over the proposed route because Mojave's proposed route would loop existing pipeline and almost exclusively use existing right-of-way. In the Central Valley, we identified five major alternative routes and a short city bypass alternative to determine whether any could be potentially environmentally preferable to the proposed route. All were eliminated from further consideration because they were longer or offered no environmental benefit over the proposed project.

In the San Francisco Bay Area, five alternative routes were developed to evaluate the potential for avoiding or reducing significant effects on sensitive environmental resources. These included three major alternative routes for the northward proposed route in Alameda and Contra Costa Counties and two alternative routes in southern and western Alameda County. The major alternative routes were screened using representative environmental indicators, and two were eliminated from further consideration because they do not present an environmental advantage over the proposed route. The remaining alternative routes were analyzed further and are compared with the proposed route in section 6.1. Table 6.0-1 compares the environmental features of these alternatives with the corresponding parts of the proposed route, as discussed below.

Because the construction of compressor stations was not found to have significant adverse effects at the proposed locations, no alternative compressor station sites were evaluated.

As discussed in section 3.4, 12 minor route variations were suggested by interested parties during scoping and information gathering for this project. These variations were suggested to resolve local concerns, but may involve tradeoffs in environmental impact. At this time, we have not determined whether they are preferable to the proposed route and are soliciting comments from the public to assist us in making this determination. In addition, we are recommending that Mojave conduct a detailed environmental, engineering, and economic analysis for each of these alternative routes and submit this information for inclusion and analysis in the final EIR/EIS.

6.1 TRACY TO ANTIOCH SOUTHERN PACIFIC RAILROAD ALTERNATIVE ROUTE

This alternative was designed to maximize the use of existing rights-of-way as the pipeline goes northward from Alameda County through Contra Costa County and to avoid or reduce effects on sensitive resources including special status species. Although this route would be 3.5 miles longer, cross more irrigation canals, and permanently affect 0.4 acre of orchards and vineyards, its use would reduce or eliminate geologic hazards such as areas with steep slopes, potential landslides, or high liquefaction potential. Both the acres of potential special status species habitat crossed and the number of residences within 50 feet would be significantly less than on the proposed route. Other than its greater length, this alternative route is environmentally superior to the proposed route.

The use of this alternative would greatly increase the use of existing rights-of-way through Alameda and Contra Costa Counties. This would substantially reduce impact on natural communities such as native grasslands and foothill oak woodlands, with a corresponding reduction in impact on sensitive species including the tiger salamander and San Joaquin kit fox, and impact on some species may be completely avoided. It would avoid recreation and other sensitive resources near the Black Diamond Mines Regional Preserve, Los Vaqueros Reservoir project area, Deltaview Golf Course,

TABLE 6.0-1

Comparison of San Francisco Bay Area Alternative Routes With Mojave's Proposed North Mainline and Palo Alto Segment

Environmental Indicator	Mojave's Proposed North Mainline Route	Tracy to Antioch Southern Pacific Railroad Alternative Route	San Joaquin Valley Pipeline Alternative Route	Mojave's Proposed Palo Alto Segment	I-680 Corridor Southward Alternative Route
Miles of pipeline	31.5	35.0	36.1	11.8	8.4
Miles within or adjacent to existing ROW	6.0	35.0	19.8	5.1	7.9
Acres of construction ROW required	248.2	275.8	284.4	93.0	66.2
Acres of permanent ROW required	38.2	42.4	43.8	14.3	10.2
Number of potentially active seismic faults cross	2	1	2 a/	3	3
Miles of slopes >15% crossed	27.8	0.0	25.5	10.3	3.3
Miles of potential landslides crossed	18.3	0.0	7.5	8.6	0.2
Miles of high liquefaction potential crossed	1.4	0.0	2.5	4.0	0.0
Number of streams/canals crossed	11/2	9/16	60/1	5/2	17/2
Miles of wetlands crossed	1.08	0.12	0.79	0.0	0.28
Acres of potential special status species habitat affected	210.2	27.6	236.8	84.7	35.7
Acres of urban/industrial land affected	16.5	52.0	18.1	12.6	9.5
Acres of agricultural cropland affected	3.15	8.06	9.14	3.1	0.0
Acres of orchards and vineyards affected	0.0	0.40	5.75	3.4	2.9
Number of residences within 50 feet of the construction ROW	124	32	≥162	28	74

---

a/ Crosses two named faults (Brentwood and Davis) and seven unnamed, inferred, concealed faults of unknown activity.

Brushy Peak/Vasco Caves, and Contra Loma Regional Park. No access roads would need to be upgraded, and visual impacts would be avoided along county scenic highways at Vasco Road, Deer Valley Road, Somersville Road, and Kirker Pass Road. Potentially significant geologic hazards, including faults and landslide-prone terrain, would be avoided.

◆ **We recommend the adoption of the Tracy to Antioch Southern Pacific Railroad Alternative Route. Mojave should realign the corresponding segment of its proposed North Mainline in Alameda and Contra Costa Counties to incorporate this alternative route alignment.**

6.2 SAN JOAQUIN VALLEY PIPELINE NORTHWARD ALTERNATIVE ROUTE

This alternative was evaluated because it was the subject of a certified EIR and was therefore considered to be buildable by the appropriate regulatory agencies. It would be 4.6 miles longer than the proposed route, and although it offers environmental advantages over the proposed route in some respects, it would have potentially greater environmental effects on other resources. It is a buildable but not preferable alternative route.

6.3 INTERSTATE 680 CORRIDOR SOUTHWARD ALTERNATIVE ROUTE

This route was identified to increase the use of existing rights-of-way and to avoid sensitive resources near Mission Peak. It is 3.4 miles shorter than the proposed route, and appears to offer geotechnical advantages and less ground disturbance, in part because it is shorter. It would, however, affect significantly more nearby residences and would cross many more streams. In addition, because CalTrans will not permit joint use of its rights-of-way, this route would not be able to use existing right-of-way, and many private landowners could potentially be affected. It is a buildable but not preferable alternative route.

7. CONCLUSIONS AND RECOMMENDATIONS

The conclusions and recommendations presented here are those of the staffs of the FERC and SLC. This Draft Environmental Impact Statement evaluates the environmental impact associated with the construction and operation of the facilities that have been proposed by Mojave for the expansion of its existing natural gas transmission system. Information provided by Mojave and further developed from data requests, field investigations, literature research, alternatives analyses, and contacts with Federal, state, and local agencies and individual members of the public indicates that the proposed Mojave Northward Expansion Project would result in a limited adverse environmental impact during construction and operation. Our analyses indicate that most of the impact would occur during construction of the proposed project and be temporary or short term. The FERC and SLC staffs have concluded that if the project mitigation is constructed and operated in accordance with Mojave's proposed mitigation and staff's recommended mitigation measures, it would be an environmentally acceptable action.

As part of our analysis, we have developed specific mitigation measures that we believe to be appropriate and reasonable for the construction and operation of the proposed natural gas facilities. We believe that these measures would substantially reduce the environmental impact that would result from the construction of the project. The additional studies or field investigations which we recommend typically result in site-specific mitigation and further reduction of impact; therefore, we are recommending that our mitigation measures be attached as conditions to any authorization issued by the FERC or SLC.

Although many factors were considered in our determination that the construction and operation of the proposed project would be an environmentally acceptable action, the principal reasons are:

- About 80 percent of the proposed route uses existing rights-of-way such as railroad or street rights-of-way which minimizes new disturbance.
- Mojave has committed to using the FERC staff's Erosions Control, Revegetation, and Maintenance Plan and Wetland and Waterbody Construction and Mitigation Procedures to reduce soil and water-related impact.
- Access to the proposed right-of-way is available from existing roads requiring no new access road construction.
- An environmental inspection and mitigation monitoring program will ensure compliance with all mitigation measures that become conditions of certification.
- We have recommended that the appropriate consultations with the FWS, DFG, and SHPO be completed and written authorizations be issued by the FERC's Director of the Office of Pipeline Regulation before Mojave can commence construction of the facilities.

7.1 ALTERNATIVES

7.1.1 No-Action and System Alternatives

The no-action alternative would avoid all of the environmental effects of the project. If the FERC and SLC deny or postpone action, existing customers would either continue obtaining natural gas from their current supplier or use alternative sources of energy, most likely oil on the basis of current economics. Noncore customers would continue to maintain the capability to store and burn both fuels.

No system alternative was identified that could meet the project objectives of providing pipeline-to-pipeline competition and provide service to the same natural gas customers as the Mojave Northward Expansion Project. Other system alternatives that may develop to serve this market conditions are considered too speculative for analysis.

7.1.2 Preferred Route Alternative

Pending receipt of public comment, we have concluded that, with the exception of the San Francisco Bay Area, Mojave's proposed route is environmentally preferable to any of the alternative routes. In the San Francisco Bay Area, we have determined that the Tracy to Antioch Southern Pacific Railroad Alternative Route is environmentally preferable to the corresponding segment of Mojave's proposed route and have recommended its use. Maps of the proposed route and Tracy to Antioch Southern Pacific Railroad Alternative Route appear in the accompanying volume II.

At this time, we do not have sufficient information to conclusively establish whether the 12 minor route variations identified in section 3 are environmentally superior to Mojave's proposed route in those locations. We have recommended that Mojave provide detailed analyses of these variations for inclusion in the final EIR/EIS. In addition, we are specifically requesting public comment on the feasibility and environmental impact associated with construction of any of these minor route variations.

7.2 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USE OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Most of the environmental effects of the proposed project would be construction-related and last only a few days in any one location. The long-term productivity of the area that would be crossed by the proposed pipeline would, therefore, not be affected except in the Mojave Desert where revegetation could take 20 to 50 years. The project would not narrow the range of beneficial uses or pose significant long-term risks to public health and safety.

7.3 SIGNIFICANT UNAVOIDABLE IMPACT

Effects on all resources identified during scoping were evaluated to determine any significant impact that would remain so after mitigation. A summary of impact and corresponding mitigation measures appears in the Executive Summary (table ES-1). The impact that cannot reasonably be avoided even after mitigation includes:

- Potential failure of the pipeline due to surface fault displacement where the pipeline crosses active faults in populated areas.
- Increased slope instability where the pipeline crosses landslide-prone terrain.
- Air quality impacts exceeding local air pollution control or management district's significant unavoidable impacts thresholds for emissions from construction-related equipment and activities during the construction period as follows:

- Mojave Desert District — CO, NO_x, and PM10
- San Joaquin Valley District — CO, VOC, NO_x, and PM10
- Sacramento District — PM10
- Bay Area District — VOC, NO_x, and PM10.

Although an extensive list of mitigation measures has been developed to reduce most adverse impact, some impact on geologic hazards and air quality might not be mitigated to less than significant levels, in which case, under CEQA, the SLC would need to make a determination of overriding considerations prior to approving the proposed project.

7.4 SIGNIFICANT IRREVERSIBLE ENVIRONMENTAL CHANGES THAT WOULD BE INVOLVED IN THE PROPOSED PROJECT SHOULD IT BE IMPLEMENTED

The major nonrenewable resources that would be consumed by the proposed project are fossil fuels used to power construction vehicles and the pipeline itself, which theoretically could be reclaimed at the end of the project. The proposed project would transport natural gas that has been purchased by large industrial and commercial customers and would become part of the infrastructure available for use by future generations. Its construction would be consistent with state policies encouraging the construction of competitive pipelines for supplying natural gas.

As discussed in section 5.11, the proposed project has been designed to meet or exceed all safety requirements, and the potential for irreversible damage during operation is slight.

7.5 RECOMMENDED MITIGATION MEASURES

This section includes two lists of specific construction procedures and mitigation measures. Section 7.5.1 lists the conditions that the FERC and SLC staffs recommend that their commissions impose on Mojave. Section 7.5.2 lists the mitigation measures that Mojave has proposed as part of its project design and that Mojave would implement if the project is approved.

7.5.1 Conditions Imposed by the FERC and SLC

To mitigate the environmental impact associated with the construction and/or operation of the proposed project, we recommend that the following measures be included as specific conditions to any Certificate or permit issued by the FERC or SLC. The agency-recommended measures (ARMs) are categorized below as general or resource-specific. Responses to ARMs 5 through 12 will assist us when we conduct field inspections and compliance monitoring activities.

7.5.1.1 General Conditions

ARM 1 Mojave shall follow the construction procedures and mitigation measures described in its application, amendments, and responses to our staff's data requests and as identified in the EIR/EIS unless modified by these certificate conditions. Mojave must:

(a) Request any modification to these procedures, measures, or conditions in a filing with the Secretary of the FERC (Secretary);

(b) Justify each modification relative to site-specific conditions;

(c) Explain how that modification provides an equal or greater level of environmental protection than the original measure; and

(d) Receive approval in writing from the FERC's Director of the Office of Pipeline Regulation **before using that modification.**

ARM 2 The FERC's Director of the Office of Pipeline Regulation has delegation authority to take whatever steps are necessary to ensure the protection of all environmental resources during construction and operation of the project. This authority shall allow:

(a) The modification of conditions of this Order; and

(b) The design and implementation of any additional measures deemed necessary (including stop work authority) to ensure continued compliance with the intent of the environmental conditions as well as the avoidance or mitigation of adverse environmental impact resulting from project construction and operation.

ARM 3 Mojave must receive written authorization from the FERC's Director of the Office of Pipeline Regulation **before commencing service from the project.** Such authorization will only be granted following a determination that rehabilitation and restoration of the right-of-way is proceeding satisfactorily.

ARM 4 Mojave shall adopt the Tracy to Antioch Southern Pacific Railroad Alternative Route and realign the corresponding segment of its proposed North Mainline in Alameda and Contra Costa Counties to incorporate this alternative route alignment.

ARM 5 The authorized facility locations shall be as shown in the EIR/EIS as supplemented by filed alignment sheets and shall include the Tracy to Antioch Southern Pacific Railroad Alternative Route as shown in figure 3.3.3-1. **As soon as they are available, and before the start of construction,** Mojave shall file with the Secretary revised detailed survey alignment maps/sheets at a scale not smaller than 1:6,000 with station positions for all pipelines approved by this Order. All requests for modifications of environmental conditions of this Order or site-specific clearances must be written and must reference locations designated on these alignment maps/sheets.

ARM 6 Mojave shall file with the Secretary detailed alignment maps/sheets and aerial photographs at a scale not smaller than 1:6,000 identifying all staging areas, pipe storage yards, new access roads, and other areas that would be used or disturbed and have not been previously identified in filings with the Secretary. This includes any alteration to facility locations filed with the FERC. Approval for all areas must be explicitly requested in writing. All areas shall be clearly identified on the maps/sheets/aerial photographs. All areas must be approved in writing by the FERC's Director of Office of Pipeline Regulation **before construction** in or near that area.

This requirement does not apply to route variations required herein or minor field realignments per landowner needs and requirements that do not affect other landowners or sensitive environmental areas such as wetlands.

Examples of alterations requiring approval include all facility location changes resulting from:

(a) Implementation of cultural resources mitigation measures;

(b) Implementation of endangered, threatened, or special concern species mitigation measures;

(c) Recommendations by state regulatory authorities; and

(d) Agreements with individual landowners that affect other landowners or could affect sensitive environmental areas.

ARM 7 **Within 60 days of the acceptance of this Certificate and before construction begins,** Mojave shall file an Initial Implementation Plan with the Secretary for review and written approval by the FERC's Director of Office of Pipeline Regulation describing how Mojave will implement the mitigation measures required by this Order. Mojave must file revisions to the plan as schedules change. The plan shall identify:

(a) How Mojave will incorporate these requirements into the contract bid documents, construction contracts (especially penalty clauses and specifications), and construction drawings so that the mitigation required at each site is clear to onsite construction and inspection personnel;

(b) The number of environmental inspectors assigned per spread and how the company will ensure that sufficient personnel are available to implement the environmental mitigation;

(c) Company personnel including environmental inspectors and contractors who will receive copies of the appropriate material;

(d) What training and instructions Mojave will give to these personnel (initial and refresher training as the project progresses and personnel change) with the opportunity for Office of Pipeline Regulation staff to participate in the training sessions;

(e) The company personnel, if known, and specific portion of Mojave's organization having responsibility for compliance;

(f) The procedures including use of contract penalties that Mojave will follow if noncompliance occurs; and

(g) For each discrete facility, a Gantt or PERT chart or similar project scheduling diagram and dates for:

    (i) The completion of all required surveys and reports;

    (ii) The mitigation training of onsite personnel;

(iii) The start of construction; and

(iv) The start and completion of restoration.

ARM 8 **Prior to construction of the project**, Mojave shall file an affirmative statement with the Secretary, certified by a senior company official, that all company personnel, environmental inspectors, and contractor personnel who will be involved with construction and restoration of each spread have been trained as specified in the Implementation Plan provided in response to condition ARM 7(d).

ARM 9 Mojave shall employ a team (i.e., two or more, or as may be established by FERC's Director of the Office of Pipeline Regulation) environmental inspectors per construction spread. The environmental inspectors shall be:

(a) Responsible for monitoring and ensuring compliance with all mitigative measures required by this Order and other grants, permits, certificates, or authorizing documents;

(b) Responsible for evaluating the construction contractor's implementation of the environmental mitigation measures required in the contract (see condition ARM 7 above) and any other authorizing document;

(c) Empowered to order correction of acts that violate the environmental conditions of this Order and any other authorizing document;

(d) Full-time positions separate from all other activity inspectors;

(e) Responsible for documenting compliance with the environmental conditions of this Order as well as any environmental conditions/permit requirements imposed by other Federal, state, or local agencies; and

(f) Responsible for maintaining status reports.

ARM 10 Mojave shall file updated status reports prepared by the head environmental inspector with the FERC and SLC **on a weekly basis until all construction-related activities including restoration and initial permanent seeding are complete**. On request, status reports will also be provided to other Federal and state agencies with permitting responsibilities. Status reports shall include:

(a) The current construction status of each spread, work planned for the following reporting period, and any schedule changes for stream crossings or work in other environmentally sensitive areas;

(b) A listing of all problems encountered and each instance of noncompliance observed by the environmental inspectors during the reporting period, both for the conditions imposed by the FERC and SLC and any environmental conditions/permit requirements imposed by other Federal, state, or local agencies;

(c) Corrective actions implemented in response to all instances of noncompliance;

(d) The effectiveness of all corrective actions implemented;

(e) A description of any landowner/resident complaints that may relate to compliance with the requirements of this Order and the measures taken to satisfy their concerns; and

(f) Copies of any correspondence received by Mojave from other Federal, state, or local permitting agencies concerning instances of noncompliance, and Mojave's response.

ARM 11 **Within 30 days of placing the certificated facilities in service**, Mojave shall file an affirmative statement with the Secretary, certified by a senior company official:

(a) That the facilities have been constructed in compliance with all applicable conditions and that continuing activities will be consistent with all applicable conditions; or

(b) Identifying which of the Certificate conditions Mojave has complied with or will comply with. This statement shall also identify any areas along the right-of-way where compliance measures were not properly implemented and the reason for noncompliance.

ARM 12 Mojave shall consult with the BLM or other Federal land management agency to determine their requirements and recommendations for facility construction, operation, and maintenance on Federal lands. If the requirements or recommendations differ from those of the staff, Mojave shall comply with the requirements and recommendations of the Federal land management agency when on Federal lands.

ARM 13 Mojave shall file with the FERC and SLC a detailed environmental, engineering, and economic analysis for each of the 12 minor route variations described in section 3.4 for inclusion and analysis in the final EIR/EIS.

7.5.1.2 Resource-Specific Conditions

Geology

ARM 14 **Prior to construction,** Mojave shall file with the Secretary a Geologic Hazards Mitigation Plan for the review and written approval of the FERC's Director of the Office of Pipeline Regulation. Mojave's investigations must include, at a minimum, all sites listed in table 5.1.2-1 (see page 5-2).

ARM 15 **Prior to construction,** Mojave shall conduct a field survey of the construction right-of-way in all areas underlain by a geologic formation identified in table 4.1.4-1 as having high paleontological sensitivity. A paleontologic monitor shall be present during all trenching activities in these areas of high sensitivity. Mojave should also monitor trenching activities on a part-time or spot-check basis in areas classified as having moderate sensitivity (see page 5-10).

ARM 16 Mojave shall develop a Paleontologic Resource Management Plan in consultation with the appropriate Federal and state agencies. The PRMP should include:

(a) Mitigation measures that would be implemented for each fossil site identified during the preconstruction field survey or discovered during construction including their controlled scientific removal;

(b) Provisions for the preparation and curation of any fossil collections;

(c) Protocol for the preparation of a final report based on the data recovered; and

(d) The requirement that all work be performed by qualified paleontologists.

The PRMP should be submitted to the appropriate Federal and state agencies and filed with the Secretary of the FERC for the review and written approval of the FERC's Director of the Office of Pipeline Regulation **prior to construction**. (see page 5-10).

Soils

ARM 17 Mojave shall halt construction on a site-specific basis in agricultural areas when rainfall or flooding results in saturated soils, which are vulnerable to slumping, compaction, and rutting. In the event that construction activities are stopped by Federal land management agencies to prevent excessive tracking and rutting, similar activities shall also be halted on nearby non-Federal lands (see page 5-18).

Water Resources

ARM 18 Mojave shall file with the FERC and SLC prior to construction a site-specific construction plan for all directional drilling sites. This plan should:

(a) Include detailed schematics of each site including the identification of existing vegetation, locations of staging areas, drilling mud and wastewater containment structures, and sediment control devices; and

(b) Address how Mojave would contain and clean up any inadvertent release of drilling mud into the waterbody or areas adjacent to the waterbody (see page 5-25).

ARM 19 Mojave shall file with the FERC and SLC an open-cut crossing plan for each waterbody listed in table 5.3.3.2-1 if the directional drilling of the waterbody is unsuccessful. The FERC's Director of the Office of Pipeline Regulation must review and approve these plans in writing **before construction of each open-cut crossing.** The plans shall be site-specific and include:

(a) The specific reasons that the directional drilling technique was not successful;

(b) How Mojave would seal the abandoned drill hole;

(c) Scaled drawings identifying all areas that would be disturbed by constructing the open-cut crossing; and

(d) Copies of the required state and USACE permits authorizing the construction of the waterbody crossings using the open-cut method (see page 5-26).

ARM 20 **Before construction,** Mojave shall file with the Secretary a revised SPCC Plan that identifies the types and quantities of fuels, lubricants, and other hazardous materials that will be stored or used in the rights-of-way and stockpile areas and the types of containers that would be used to store these materials (see page 5-20).

ARM 21 **Before construction,** Mojave shall file with the Secretary a Groundwater Monitoring Plan for areas where blasting might be required. The plan should:

(a) Identify the locations by mileposts of all private wells within 150 feet of blasting activities;

(b) Outline the procedures Mojave would use, with the well owner's permission, to conduct pre- and postconstruction monitoring of well water quality and yield; and

(c) **Within 30 days of placing the facilities in service,** Mojave shall file a report with the Secretary that discusses any complaints concerning well water quality or yield and how they were resolved (see page 5-21).

ARM 22 **Prior to constructing facilities in the California coastal zone,** Mojave shall file with the FERC and SLC a statement from the BCDC that the project is consistent with the California Coastal Zone Management Plan (see page 5-28).

Vegetation

ARM 23 Mojave shall use the FERC staff's Wetland and Waterbody Construction and Mitigation Procedures in appendix C when crossing the following sensitive habitats even if they do not meet the U.S. Army Corps of Engineers' criteria for jurisdictional wetlands: riparian areas, seasonal wetlands, vernal pools, and nonnatural ponding areas containing sensitive invertebrate species (see page 5-33).

ARM 24 Mojave shall restore all areas disturbed by the construction of its project in accordance with the Project Revegetation Requirements in appendix B unless modified by these conditions (see page 5-31).

ARM 25 Mojave's construction activities shall avoid any Joshua trees taller than 8 feet, and any salvaged Joshua trees, yuccas, and cacti shall be replaced in the right-of-way **immediately after the subsoil and topsoil are backfilled into the trench** (see page 5-34).

ARM 26 **Prior to construction,** Mojave shall consult with the SLC and DFG regarding any compensation that could be required for permanent loss of riparian woodlands or any restoration required. The level of compensation required shall be determined on a case-by-case basis depending on the density and quality of each riparian area affected. (see page 5-36).

ARM 27 Where Mojave is unable to avoid vernal pools by realigning or narrowing the right-of-way, Mojave shall install its pipeline across these areas using the horizontal boring or directional drilling method.

If avoidance of vernal pools by any means is not feasible, Mojave shall file with the FERC and SLC a site-specific vernal pool restoration plan developed in consultation with the USACE, FWS, and DFG that includes:

(a) Identification of the acreage and habitat value of the vernal pools to be removed;

(b) Details of the procedure Mojave would use to restore the hardpan layer;

(c) A postconstruction monitoring program with success criteria based on monitoring within adjacent undamaged vernal pools; and

(d) A protocol for identifying offsite compensatory acreage of in-kind habitat at a ratio of 4:1 (see page 5-38).

ARM 28 **Prior to construction,** Mojave shall submit to the FERC, SLC, and DFG, for their approval, a report citing the locations where avoidance of specimen oak trees in foothill woodlands is not possible and a site-specific explanation of each removal (native oaks larger than 12 inches dbh are considered specimen trees) (see page 5-39).

ARM 29 Mojave shall coordinate with the Santa Clara Valley Water District in crossing Coyote Creek at MP 30 on the Palo Alto Segment to avoid the sensitive riparian habitat at that location (see page 5-50).

Special Status Species

ARM 30 For desert tortoise, Mojave shall implement the following mitigation measures:

(a) In the Mojave Desert, Mojave shall inspect open trenches for desert tortoise three times a day as well as immediately before backfilling. Stockpile areas shall be fenced. All desert tortoise burrows within the right-of-way shall be inspected using a fiber-optic scope; and

(b) Mojave shall provide off-site compensation for the previously disturbed rights-of-way for Loops 1, 2, and 3. The compensation ratio derived for BLM Category 1 and 3 lands should be decreased by a factor of 4/25ths or 0.16 and applied only to those areas previously disturbed (see page 5-58).

ARM 31 Mojave shall extend its observance of the nesting season of Swainson's hawk to August 15 or until fledglings are no longer dependent on nest tree habitat (see page 5-62).

ARM 32 Mojave shall include the following mitigation measures for vernal pool fairy shrimp and vernal pool tadpole shrimp in the site-specific vernal pool restoration plan (see ARM 27):

(a) The topsoil, which could contain encysted eggs during the dry period, shall be segregated before construction; and

(b) Restoring the depression shall include replacing the topsoil, recontouring, and compacting the soils to restore hydrologic conditions (see page 5-65).

ARM 33 Mojave shall provide compensation for the San Joaquin kit fox habitat at a ratio of 1.1:1 to offset the temporary disturbance caused by project-related activities in the Coast Ranges (see page 5-68).

ARM 34 Mojave shall construct in occupied habitat of the blunt-nosed leopard lizard only during the dormant period from November 1 to April 1 whenever possible (see page 5-63).

ARM 35 If occupied habitat of the California tiger salamander cannot be avoided, **prior to construction**, Mojave shall prepare a mitigation plan in consultation with the FERC, SLC, and FWS. The plan shall include restoration and/or compensation for loss of habitat, including ponds and their watersheds, that will result in no net loss of habitat (see page 5-73).

ARM 36 If occupied habitat of the Alameda whipsnake cannot be avoided, Mojave shall provide offsite compensation at a 3:1 ratio (see page 5-71).

ARM 37 If known habitat of the San Francisco garter snake on the Hunters Point Segment cannot be avoided, Mojave shall prepare and implement a mitigation plan in consultation with the FWS and DFG **prior to construction** (see page 5-72).

ARM 38 Mojave shall attempt to avoid removing nest trees for the golden eagle within the construction right-of-way. If nest tree removal is unavoidable, Mojave shall discuss replacement on a case-by-case basis with the DFG. Mojave shall also extend observance of the nesting season to August 15 or until all fledglings have left the nest (see page 5-69).

ARM 39 Mojave shall conduct additional or new surveys where necessary, including those segments of the proposed route that were previously inaccessible (see table 5.6.2-1), for the federally or state listed or proposed endangered and threatened species. Surveys shall also include plant species in the California Native Plant Society Lists 1 through 4 and species of special concern. Before the initiation of surveys, Mojave shall consult with the FWS and DFG for appropriate species list survey methods and periods for each species. The survey reports and any FWS and DFG comments on the survey and its conclusions shall be filed with the FERC and SLC. The survey reports shall include the following information:

- name(s) and qualifications of the person(s) conducting the survey;
- method(s) used to conduct the survey;
- date(s) of the survey; and
- area surveyed (include the mileposts surveyed).

For species identified during preconstruction surveys and in those areas previously inaccessible, Mojave shall propose mitigation that would substantially minimize or avoid potential impacts. Where ever possible, avoidance by narrowing the right-of-way, route realignment, or special construction techniques shall be the preferred mitigation. If avoidance is not feasible, off-site compensation may be required to mitigate the impact to less than significant. Mojave must receive written approval from the SLC and the FERC's Director of the Office of Pipeline Regulation before implementing mitigation for these sensitive species (see page 5-52).

ARM 40 Mojave shall not begin construction activities until:

(a) The FERC and SLC staffs receive comments from the FWS and DFG regarding the proposed action;

(b) The FERC staff completes formal consultation with the FWS, if required;

(c) The SLC staff completes formal consultation with DFG, if required; and

(d) Mojave has received written notification from the FERC's Director of Office of Pipeline Regulation that construction may begin. The Director has delegation authority to modify the conditions that apply to the 35 federally listed or proposed endangered or threatened species addressed in the EIR/EIS as a result of FWS consultation.

Land Use, Visual Resources, Recreation and Transportation

ARM 41 For all residences within 50 feet of the construction work area, Mojave shall:

(a) Not remove mature trees or specialized landscaping within the construction work area unless necessary for the safe operation of construction equipment;

(b) Restore all lawn areas and landscaping within the construction work area immediately after backfilling the trench;

(c) Fence the edge of the construction work area adjacent to a residence for 100 feet on either side of the residence to ensure that construction equipment and materials including the spoil pile will remain within the approved construction work area; and

(d) Maintain a minimum of 25 feet between any residence and the edge of the construction work area or, where this is not possible, file an explanation and a site-specific plan with the Secretary for the review and written approval of the Director of the Office of Pipeline Regulation prior to construction. The site-specific plan should apply to the area extending at least 100 feet on either side of the residence and include:

  (i) A description of the special construction techniques Mojave will use such as reduced pipeline separation, centerline adjustment, stovepipe or drag-section techniques, pipeline crossover, or boring;

  (ii) A commitment that the trench will not be excavated until the pipe is ready for installation and that the trench would be backfilled immediately after pipe installation; and

  (iii) A site plan drawn to scale that shows the location of the residence in relation to the new pipeline, the edges of the construction work area, the edges of the new permanent right-of-way, and the locations of other nearby residences, structures, roads, and waterbodies (see page 5-90).

ARM 42 If Mojave constructs the North Mainline on Mojave's proposed route, Mojave shall install temporary safety fence and warning signs between the trench and nearby areas of high-volume public use in Contra Loma Regional Park from MP 269.8 to MP 270.8 or from MP 278.6 to MP 279.5 depending on the final project configuration (see page 5-103).

ARM 43 Mojave shall work closely with Stanford University and Candlestick Park to schedule construction activities to minimize conflicts with scheduled events (see page 5-104).

Noise

ARM 44 **No later than 60 days after placing the Lindsay Compressor Station in service,** Mojave shall conduct and file a noise survey with the FERC and SLC. If the noise attributable to the operation of this station at full load exceeds the L_{dn} limit of 55 dB(A) at any nearby NSAs, Mojave should install additional noise controls to meet that limit within 1 year of the in-service date. Mojave should confirm compliance with the L_{dn} limit of 55 dB(A) by filing a second noise survey with the FERC and SLC **no later than 60 days after installing the additional noise controls** (see page 5-133).

Safety and Reliability

ARM 45 Mojave shall treat soil suspected of being contaminated in accordance with the DTSC requirements for contaminated soils until the required soil analysis is complete (see page 5-144).

ARM 46 Mojave shall consult with the appropriate Federal, state, or local agencies to determine which known or suspected contaminated sites require further investigation and what mitigation may be employed to minimize impact in the event that contaminated areas are crossed. Any abandoned hazardous waste materials discovered during construction shall not be disturbed and shall be promptly reported to the respective state authorities or the EPA (see page 5-144).

Cultural Resources

ARM 47 To ensure that the FERC's and other cooperating agencies' responsibilities under the NHPA and its implementing regulations are met, Mojave shall defer construction and use of its facilities and any staging, storage, temporary work areas, and new or to be improved access roads until:

(a) Mojave prepares and submits to the FERC, SLC, BLM, and SHPO a revised inventory report, any testing and evaluation reports, and any necessary treatment plans;

(b) Mojave files with the Secretary the comments of the SLC, BLM, and SHPO on all reports submitted for review; and

(c) The FERC's Director of the Office of Pipeline Regulation notifies Mojave in writing that it may proceed.

Mojave shall label all reports and plans identifying locations of cultural resources as "PRIVILEGED INFORMATION — DO NOT RELEASE." (See page 5-118.)

7.5.2 Mitigation Measures Proposed by Mojave

The following mitigation measures have been proposed and will be implemented by Mojave as part of the project. These Mojave-proposed measures (MPMs) are categorized below as general or resource-specific.

7.5.2.1 General Mitigation Measures

The following conditions shall apply to any Certificate issued to Mojave to construct and operate the proposed project.

MPM 1 To reclaim all construction sites, Mojave will:

(a) Re-establish preconstruction contours, stabilize banks, restore staging areas, and restore all disturbed areas.

(b) Use the topsoil removed during clearing and grading in restoration.

(c) Revegetate disturbed areas considering vegetation type, drainage, and slope.

(d) Minimize slopes and leave surfaces rough or serrated to hold seeds and allow good plant establishment.

(e) Plant seeds in time to germinate in early winter and provide a thick root mat to resist erosive forces.

(f) Use mulch as necessary to help establish vegetation, hold seeds in place, and maintain moisture during dry periods according to the specifications of the regulatory agency or landowner.

(g) Direct the environmental inspectors to ensure that site reclamation is performed in accordance with FERC guidelines.

MPM 2 Mojave will:

(a) Limit construction vehicles to authorized areas and vehicle speeds on rights-of-way to 20 miles per hour.

(b) Inspect open trenches and remove trapped animals daily and before burying or capping pipes.

(c) Dispose food-related trash in closed containers.

(d) Prohibit pets and firearms onsite.

(e) Use only agency-approved rodenticides and herbicides at the sites of compressor stations and other aboveground facilities.

(f) Restrict all construction personnel to the construction right-of-way in sensitive areas at all times including work breaks.

MPM 3 When the pipeline is abandoned, Mojave will:

(a) Continue maintaining the pipeline in order to prevent scour and damage from exposure of the abandoned system.

(b) Fill and seal the pipeline with nitrogen gas at 10 psig (pressure per square inch gauge).

(c) Push a swab pig through the pipeline with nitrogen gas.

MPM 4 At all aboveground facilities, Mojave will:

(a) Minimize disturbance to the sites by following proper construction procedures and the FERC's Erosion Control, Revegetation, and Maintenance Plan (appendix A).

(b) For access road improvements, obtain permits from appropriate jurisdictional agencies, conform to applicable standards, and design and conduct appropriate surveys to consider grades, soils, compaction, minimum widths, horizontal and vertical curvature, outslope, drainage, and cut-and-fill slopes.

MPM 5 Mojave will employ at least one environmental inspector per construction spread who will be in this position full-time and separate from all other activity inspectors. The environmental inspector will be responsible and empowered to:

(a) Monitor and ensure compliance with all mitigative measures.

(b) Evaluate the construction contractor's implementing of the mitigation measures required in the contract.

(c) Order the correction of acts that violate the environmental conditions of the Certificate.

(d) Document compliance with the environmental conditions of the Certificate.

(e) Prepare status reports.

MPM 6 During pipeline operation, Mojave will maintain the pipeline including:

(a) Ensuring that maintenance operations include pigging of the pipeline for cleaning with pig launcher and receiver sites located at compressor stations, pipeline endpoints, and specified intermediate locations on each segment.

(b) Handling and disposing waste products collected during pigging in compliance with all applicable laws and regulations.

7.5.2.2 Resource-Specific Mitigation Measures

Geology

In addition to the mitigation measures listed below for geologic hazards and geologic and paleontologic resources, the results of Mojave's proposed geologic hazard investigations will be used to design other route-, fault-, or hazard-specific mitigation measures.

MPM 7 Mojave's proposed mitigation design for fault crossings will include some or all of the following standard industry mitigation measures:

(a) Rerouting the pipeline to cross faults at as close to a right angle as possible to minimize the compressional forces and amount of shearing the pipeline would experience during an earthquake.

(b) Placing the pipe in a wide V-shaped trench as shallow as possible within the minimum required depth of cover and using loose, light-weight, granular backfill to allow the trench-pipe system to accommodate displacement on the fault or force the pipe to the ground surface without rupture during large-scale fault movement.

(c) Placing the pipe inside a larger pipe where bored crossings are indicated to isolate the pipeline from the fault displacement.

(d) Increasing the pipe wall thickness to withstand greater stress.

(e) Placing the pipe in structural supports that keep the pipe in place while the supports are displaced laterally during any surface fault rupture.

(f) Installing automatic shut-off valves on both sides of active fault crossings.

MPM 8 Mojave's proposed mitigation measures that will be implemented in areas of significant seismic ground shaking will include the following standard industry measures:

(a) Complying with pipeline design and construction codes and specifications.

(b) Designing aboveground structures to withstand the predicted level of ground shaking as well as site-specific soil conditions.

MPM 9 Mojave's proposed mitigation design for potential pipeline failure due to liquefaction or lateral spreading will include some or all of the following standard mitigation measures:

(a) In-place compaction.

(b) Gravel replacement of liquefiable soils.

(c) Stone column supports.

(d) Grouting.

(e) Supporting the pipe on deep foundations.

(f) Placing the pipe below liquefiable materials.

(g) Routing the pipeline around liquefiable areas.

(h) Installing automatic shutoff valves beyond the limits of potential lateral spreading.

MPM 10 Mojave's proposed mitigation design for potential pipeline failure due to collapsible soils will include some or all of the following standard mitigation measures:

(a) Removing collapsible soils.

(b) Constructing deep foundations to bypass collapsible soils.

(c) Precollapsing soils prone to hydrocompaction by wetting.

MPM 11 Mojave's proposed mitigation design for potential pipeline failure due to landslides or potential slope instability will include some or all of the following standard mitigation measures:

(a) Rerouting where feasible to avoid major slide areas.

(b) Burying the pipe deeper than the slide zone.

(c) Stabilizing landslides by remedial grading or other methods if economically feasible.

(d) Designing the pipeline crossing to minimize damage in the event of mass movement.

(e) Using automatic shutoff valves in landslide prone areas.

MPM 12 Mojave's proposed mitigation design for potential pipeline failure due to settlement in areas underlain by Bay Muds will include some or all of the following standard mitigation measures:

(a) Designing a flexible pipeline.

(b) Excavating and replacing Bay Muds with granular material.

(c) Placing the pipeline on piles.

(d) Rerouting the pipeline.

MPM 13 To mitigate the hazard potential that could result from pipeline construction near existing oil and natural gas wells, Mojave will:

(a) Coordinate with the field operations managers of these wells to ensure that pipeline construction will not result in a hazard.

(b) Maintain adequate clearances and access for well workover equipment during construction.

Soils

MPM 14 Mojave will incorporate into its general construction plan the FERC's Erosion Control, Revegetation, and Maintenance Plan (appendix A), which outlines procedures to minimize erosion and sedimentation resulting from pipeline construction and operation. The mitigation measures specified in the FERC plan are:

(a) Supervision and inspection: Environmental inspectors will ensure compliance with the environmental conditions of Mojave's Certificate, authorization, and other permits and approvals.

(b) Clearing and pipe installation:

(i) On annually cultivated or rotated agricultural lands, residential areas, and other areas at the landowner's or land management agency's request, the topsoil and subsoil removed from the trench will be segregated and stored as discrete rows within the right-of-way adjacent to the portion of the trench from which they were removed. Stones larger than 4 inches in diameter will be separated from the topsoil to prevent possible damage to farm equipment.

(ii) Any drainage tiles damaged during construction will be repaired to their original or better condition in accordance with the landowner's specifications.

(iii) Water flow in crop irrigation systems will be maintained unless shutoff has been coordinated with affected parties.

(iv) Temporary slope breakers will be used to direct water runoff away from the construction right-of-way into energy-dissipating devices.

(v) Temporary sediment barriers will be placed at the bases of slopes adjacent to all road or waterbody crossings where vegetation has been disturbed to prevent sediment migration offsite. These barriers will remain in place until permanent revegetation measures are judged successful.

(vi) Trench breakers will be used on all slopes adjacent to waterbodies and wetlands and in agricultural fields and residential areas if needed. Trench breakers are typically sacks of sand or soil that are placed in a trench around the pipe to prevent subsurface channeling of water along the trench.

(c) Cleanup and restoration:

(i) If final cleanup and installation of permanent erosion control measures cannot be completed within 10 days of backfilling the trench, all required temporary erosion control structures will be installed and maintained.

(ii) If requested by landowners or land management agencies, large rocks and slash will be spread over the right-of-way during cleanup to reduce erosion, provide microsites for seedling growth, and discourage off-road vehicle traffic.

(iii) Permanent slope breakers will be constructed and maintained in all areas except cultivated lands and lawns following the recommendations of the local soil conservation authorities.

(iv) In most areas, rutted or compacted soils will be loosened and restored by ripping or chiseling. For any severely compacted soils in agricultural areas, a "green manure" crop such as alfalfa will be plowed in to decrease soil bulk density and improve productivity.

(v) All turf, ornamental shrubs, and other landscaping will be restored to the landowners' specifications, or the landowners would be compensated in an amount sufficient for replacement.

(d) Revegetation:

(i) In disturbed areas, Mojave will prepare seed beds following the recommendations of local soil conservation authorities as to the need for fertilizer and Ph-modifying agents.

(ii) Mojave will mulch all dry sandy sites and slopes steeper than 8 percent with 2 tons of straw, hay, or its equivalent per acre unless the local soil conservation authority recommends otherwise in writing. The mulch would be anchored immediately using a mulch-anchoring tool or liquid mulch binder. Jute thatching or banded fiber blankets would be used on streambanks instead of straw or hay.

(iii) Mojave will conduct followup inspections and take corrective actions until revegetation is successful.

Water Resources

MPM 15 To mitigate the potential effects of blasting on water supply wells, Mojave will provide a temporary source of water and repair, replace, or restore any affected well to its former capacity if the groundwater supply is adversely affected.

MPM 16 Mojave will mitigate impact on shallow groundwater by:

(a) Following the Spill Prevention, Containment, and Control Plan (SPCC Plan) to prevent and clean up spills of fuels, lubricants, and other chemicals.

(b) Specifying collection and disposal procedures for wastes generated during vehicle maintenance.

(c) Requiring each construction crew to have sufficient supplies of absorbent and barrier materials on hand to rapidly recover any spills.

(d) Developing standard procedures for the excavation and offsite disposal of any soil or other materials contaminated by a spill.

(e) Prohibiting refueling and hazardous materials storage within 200 feet of all private wells and 400 feet of all municipal or community water supply wells.

MPM 17 To mitigate effects on water table elevations and natural soil strata, Mojave will use natural backfill to fill the trench and construct trench breakers (water diversion dams) along the trench where nonnative backfill is used.

MPM 18 Mojave will mitigate any impact on private groundwater wells and, if necessary, provide an adequate water supply to the affected parties in the interim.

MPM 19 Additional mitigation measures such as predischarge testing and proper disposal of water from trench dewatering will be included in its NPDES and Waste Discharge Requirements permits issued by the RWQCB.

MPM 20 Mojave will incorporate into its general construction plan the FERC's Wetland and Waterbody Construction and Mitigation Procedures (appendix C). The relevant mitigation measures specified in the Procedures are:

(a) Locating staging areas at least 50 feet from the waterline on both sides of a wetland or waterbody crossing. At the crossing of a minor or intermediate stream (i.e., a stream less than 100 feet wide), the staging areas will be 40 feet wider than the construction right-of-way for 100 feet along the right-of-way beginning 50 feet from the waterline. At the crossing of a major stream or river, the staging areas will be 50 feet wider than the right-of-way for 500 feet. If topography or other factors prevent locating a staging area at least 50 feet from the waterline, the staging area will be permitted no closer than 10 feet from the waterline.

(b) If more space is found to be needed during construction, stopping work and submitting a site-specific construction plan to the FERC for approval before resuming construction.

(c) Not clearing vegetation between the staging areas and the waterbody.

(d) Complying with Section 404 nationwide permit program conditions at a minimum.

(e) Temporarily stockpiling excavated material, called spoil, at least 10 feet from streambanks; using sediment filter devices to prevent the spoil from returning to the stream during construction; and returning spoil removed from a dry wash or intermittent stream to the ditch after the pipe is laid.

(f) Ensuring that construction equipment, except that used by clearing crews, crosses waterbodies on bridges.

(g) Completing trenching and pipeline installation across a minor stream within 24 hours unless blasting were required and across an intermediate stream (between 10 and 100 feet wide) within 48 hours.

(h) Stabilizing and returning streambanks to preconstruction contours.

(i) Revegetating disturbed riparian areas with a mix of conservation grasses and legumes.

(j) Maintaining sediment filter devices at all streambanks until revegetation of the right-of-way has been judged successful.

MPM 21 To mitigate streambed scour at stream crossings, engineering analyses would be conducted to estimate the expected scour depth of the chosen design storm, and the pipeline crossing would be constructed so that it is lower than the expected scour plus an additional factor of safety. Alternatively, rip-rap large enough to withstand the tractive forces of the design storm flow will be emplaced to protect the pipeline from scour. Additionally, crossing streams at a bend will be avoided to minimize the bend scour that could occur, and construction techniques will be used that would minimize disturbance of the channel material and vegetation at the stream crossing to enhance the stability of the channel material.

MPM 22 Because the EPA has delegated authority to issue NPDES permits under the Clean Water Act, Section 402, to the CSWRCB, and the permits are administered by the RWQCBs, Mojave will need to obtain an NPDES permit from the RWQCB to discharge to a waterbody or a Waste Discharge Requirement permit to discharge to land. Mojave will need CSWRCB approval of its test water source as well as its test water and trench dewatering discharge sites prior to use. The CSWRCB approval for a given discharge would include levels for contaminants that could not be exceeded in the water to be discharged, and Mojave will ensure that these levels are not exceeded.

MPM 23 **Prior to construction,** Mojave will prepare a Storm Water Pollution Prevention Plan (SWPP Plan) in compliance with the U.S. Environmental Protection Agency's (EPA's) National Stormwater Program General Permit. The SWPP Plan will address:

(a) Soil stabilization practices. .

(b) Control practices to prevent a net increase in sediment load in storm water discharge.

(c) Control practices to reduce the tracking of sediment onto public or private roads e.g., placing gravel at entrances to roads or restricting traffic during and after storms.

(d) Control practices to reduce wind erosion of spoil piles and construction areas.

(e) Postconstruction, waste management and disposal, and equipment maintenance, inspection, and repair practices.

MPM 24 Mojave will directionally drill the 12 crossings of major rivers and streams wider than 100 feet.

MPM 25 Mojave will bore beneath most irrigation canals, especially lined canals, but would bridge the California Aqueduct and Delta Mendota Canal. Any open-cut crossing of a canal would be done when the canal is empty. Mojave will also:

(a) Coordinate any necessary irrigation system water shutoffs with the affected parties.

(b) Be responsible for any damages that might result from a project-related interruption in an irrigation system.

(c) Upon completion of the crossing, compact the bottom and banks of the canal and restore them to preconstruction conditions.

(d) Dewater trenches only to the extent required for pipe installation.

(e) Place trench backfill in lifts to allow removal of the piling and compaction of the fill material as necessary.

MPM 26 The mitigation measures that will be employed to protects the levees would depend on the soil stability and water level and could include:

(a) Maximizing the distance between the edge of the trench and the toe of the levee.

(b) Sloping the sides of the trench to support the levee where stable soils exist.

(c) Providing shoring where adequate support could not be provided through sloping the sides of the trench; the shoring would be continuous where water intrusions are anticipated.

(d) Using a system of interlocking steel sheet pilings where saturated or unstable soils were encountered.

(e) Where the pipeline would be in a levee, locate the trench as near to the center of the levee as possible.

MPM 27 To mitigate any effects on the Contra Loma and Mallard Reservoirs and the watershed draining into the Contra Loma Reservoir, Mojave will follow the erosion control procedures in appendix A including:

(a) Installing trench breakers to prevent subsurface channeling of water along the trench.

(b) Setting up sediment barriers to prevent runoff from carrying sediment downslope to the reservoir.

(c) Regrading and contouring the trench to blend into the hillside.

MPM 28 Although no specific locations have been identified where the proposed pipeline route crosses areas of direct acid runoff from abandoned surface mines, if areas of suspected acid runoff are encountered, Mojave will:

(a) Use a pH meter to evaluate the acidity of the runoff.

(b) If the measured Ph is significantly less than the average Ph of surface water or groundwater in the project area, report the results to the RWQCB and implement the appropriate site-specific mitigation measures agreed on the RWQCB.

Vegetation

MPM 29 To mitigate impact on vegetation, Mojave would implement the FERC staff's Erosion Control, Revegetation, and Maintenance Plan (Plan) in appendix A and Wetland and Waterbody Construction and Mitigation Procedures (Procedures) in appendix C. Other mitigation measures that Mojave would implement are:

(a) Identifying noxious weeds during preconstruction surveys; where noxious weeds are found, following the recommendations of county agricultural commissioners to eradicate and prevent the spread of the weeds including rinsing vehicles before leaving the immediate vicinity of the noxious weeds; and postconstruction surveillance of the right-of-way to determine whether control has been effective or whether additional measures are necessary.

(b) Making minor route realignments in riparian and oak woodland communities to avoid disturbing trees.

(c) Limiting the maintained right-of-way width to 10 feet in wooded riparian areas.

(d) Directionally drilling major stream crossings to avoid impact on associated riparian habitat.

MPM 30 Mojave will identify all Federal jurisdictional wetlands using the USACE methods described in section 4.4. According to these Procedures, construction through wetlands must, at a minimum, comply with Nationwide Section 404 permit conditions. The Procedures include:

(a) Using the minimum required right-of-way and disturbing as little vegetation as possible.

(b) Using only existing roads or the pipeline right-of-way for access into wetlands.

(c) Limiting entry of equipment into wetlands.

(d) Locating staging areas at least 50 feet from wetland boundaries.

(e) Using adequate erosion and sediment control measures to prevent soil from flowing off the right-of-way.

(f) Storing fuel and refueling equipment at least 100 feet from wetland boundaries.

(g) Limiting the pulling of tree stumps and grading to directly over the trench and, whenever possible, leaving root systems intact.

(h) Segregating the top foot of topsoil and returning it to its original position when backfilling the trench.

(i) If standing water or saturated soils are present, using low-ground-weight equipment or operating equipment on timber riprap, equipment mats, or geotextile fabric and gravel fill.

(j) Removing all timber riprap, equipment mats, geotextile fabric, and gravel fill upon completing the crossing.

(k) Installing and maintaining temporary sediment filter devices in the right-of-way until revegetation has been successful.

(l) Installing trench and slope breakers and/or sealing the trench bottom to maintain the original wetland hydrology.

(m) Revegetating with native wetland species while preventing the invasion of undesirable, exotic species.

MPM 31 To mitigate impact on Mojave desert scrub communities, Mojave will implement the following measures:

(a) Minimize blading, leaving root crowns intact to enable some species to recover more quickly.

(b) Segregate and properly restore topsoil and seed banks.

(c) Create favorable conditions for seedling establishment by imprinting.

(d) Salvage and replant Joshua trees, yuccas, and cactus.

(e) Provide compensation funds or acreage for sensitive species habitat loss in consultation with the regulatory agencies (see section 5.6).

MPM 32 Mojave will mitigate impact on nonnative grasslands as follows:

(a) Salvage and replace topsoil in the construction right-of-way.

(b) Seed areas of slope instability or potential erosion problems.

(c) Provide compensation acreage, calculated in consultation with the regulatory agencies, where nonnative grasslands supporting sensitive species could not be avoided (see section 5.6).

MPM 33 To mitigate the impact on chenopod scrub communities, Mojave will:

(a) Segregate, salvage, and replace topsoil in the construction right-of-way.

(b) Recontour, imprint, seed, and mulch according to the Project Revegetation Requirements in appendix B.

MPM 34 To minimize impact on riparian woodlands, Mojave will:

(a) Where feasible, make minor route realignments to avoid riparian woodlands.

(b) Directionally drill major stream crossings.

(c) Provide compensation or acreage calculated in consultation with the regulatory agencies, where riparian habitat supporting sensitive species could not be avoided (see section 5.6).

(d) Limit the maintained right-of-way in heavily wooded riparian areas to 10 feet wide.

MPM 35 To mitigate impact on vernal pools, Mojave will:

(a) Realign the proposed route or narrow the construction right-of-way to avoid vernal pools wherever possible.

(b) Where avoidance is not possible, provide compensation acreage calculated in consultation with the regulatory agencies (see section 5.6).

(c) Avoid seeding of adjacent grassland within 50 feet of vernal pools; rather, salvage and stockpile the seedbank-containing topsoil for subsequent replacement in the right-of-way at least 50 feet from vernal pools.

MPM 36 To mitigate impact on foothill woodlands, Mojave will:

(a) Make minor route realignments or narrow the right-of-way to avoid stands of trees, which are both feasible because of the openness of these woodlands.

(b) Salvage and replace topsoil.

(c) Seed areas of slope instability or potential erosion problems.

(d) Replace removed oak trees larger than 6 inches dbh with container plants or acorns at ratios of 10:1 and 30:1, respectively.

(e) Limit the pulling of tree stumps and grading to directly over the trench and, whenever possible, leave root systems intact.

Wildlife and Aquatic Resources

MPM 37 To mitigate the impact on wildlife occurring in sensitive habitats including mixed riparian woodlands and wetlands, Mojave will:

(a) Avoid trees, and larger shrubs in foothill woodland communities by minor route realignments.

(b) Avoid mixed riparian woodlands by either minor realignments or directional drilling at major stream crossings.

(c) Limit the maintained right-of-way in heavily wooded areas to 10 feet wide and allow the remaining portion of the right-of-way to revegetate.

(d) Provide compensation funds or acreage for loss of sensitive species habitat (i.e., vernal pools, and riparian habitat) in consultation with appropriate regulatory agencies (see section 5.6).

(e) Implement additional mitigation measures outlined in section 5.4 on vegetation and wetlands.

(f) In all areas, design and construct project-related powerlines in such a way as to protect birds from electrocution and collision.

MPM 38 To mitigate the impact on fish, Mojave will follow the Procedures in appendix C and comply with the following:

(a) Staging areas will be at least 50 feet from the water's edge wherever possible.

(b) Fuels and hazardous materials will not be stored within 100 feet of waterbodies.

(c) Major stream crossings containing viable fisheries will be directionally drilled (see table 4.3.2-1).

(d) Any in-stream construction will be conducted during low-flow periods and follow mitigation measures outlined in section 5.3.3.1.

Special Status Species

MPM 39 Mojave will implement the following measures to mitigate impact on special status terrestrial species:

(a) Perform preconstruction surveys to identify occupied habitats in order to make minor realignments that would avoid damage to species and to provide a baseline against which to measure actual project impact. The surveys would be conducted within the timeframes specified by the FWS or DFG and would clearly mark burrows, nests, plant locations, and sensitive species habitat within and adjacent to the construction zone.

(b) Conduct a worker education program to instruct all construction and operation personnel on basic sensitive species identification and mitigation measures. Specific information about sensitive species, their habitats, and sensitivities will be included in the program for all personnel who could encounter the species. Additionally, workers would be instructed on the penalties for noncompliance with the mitigation plan or violation of the endangered species acts.

(c) Inspect each blasting zone immediately before blasting to identify active burrows and remove any individuals of sensitive animal species that are seen on the ground surface. After blasting, active burrow entrances would be checked to ensure that they are open, and, if necessary, active burrows that were plugged or collapsed by the blast would be excavated and any trapped animals would be released.

(d) Report any accidental death or injury of a listed animal species to the DFG and FWS immediately and follow the DFG's and FWS's handling instructions.

(e) Restore the right-of-way through natural habitats and monitor natural and artificial revegetation until the success criteria are met.

(f) Compensate for permanent or long-term loss of habitat with funds or acreage on the basis of the species and acreages affected.

(g) Not use herbicides or rodenticides in construction areas except at permanent aboveground facilities.

MPM 40 For the desert tortoise, Mojave will implement the following measures:

(a) During the preconstruction surveys in all areas of known and potential desert tortoise habitat within and adjacent to the construction zone, tortoise burrows will be identified and clearly marked to prevent crushing and take.

(b) Each tortoise burrow in or near the construction right-of-way that could be avoided by construction activities will be protected by flagging stretched between stakes, at least 20 feet from the burrow on sides bordered by construction activities. No construction activities would occur within these exclusion zones, which will be clearly labeled with signs identifying the purpose and restrictions on access.

(c) Tortoise burrows that could not be avoided will be excavated by hand down to the tortoises, which will be removed. Burrows will be excavated by or under the supervision of qualified tortoise biologists.

(d) Tortoises removed from burrows or found aboveground will be relocated at least 150 feet from the construction right-of-way but within 300 feet of the point of capture. Tortoises will only be handled by qualified biologists according to protocols agreed upon by the FWS and DFG. Biological monitors along the loops will be specially trained in surveying and handling procedures for desert tortoise. These procedures will vary according to the season in which construction occurs. Artificial hibernacula could be required in the winter, and rehydration could be required in the summer.

(e) Compensation for loss of habitat will follow BLM and DFG guidelines for projects affecting less than 1,000 acres as calculated in appendix D (DOI and DFG, 1992). A ratio of 4:1 will be used to compensate for long-term habitat loss in newly disturbed areas.

MPM 41 For the Mojave ground squirrel, Mojave will identify active burrows as follows:

(a) The preconstruction surveys will be conducted between MP 1.9 and MP 22.9 on Loop 3 simultaneously with preconstruction surveys for desert tortoise.

(b) Flagged exclusion zones will be established around all active Mojave ground squirrel burrows that could be adversely affected by construction activities. Construction activities, especially vehicle activity and equipment storage will be prohibited or minimized, will be within the exclusion zones.

(c) Any known Mojave ground squirrel burrows within the construction right-of-way that could not be avoided will be carefully destroyed following DFG guidelines using hand tools until it is certain that the burrow is inactive.

MPM 42 For burrowing owl, Mojave will implement the following measures:

(a) Before the breeding season, owls living within the right-of-way will be removed by placing a one-way door on the burrow entrance. Once the burrow has been abandoned, it will be permanently closed.

(b) Exclusion zones will be established around burrows within or immediately adjacent to the construction right-of-way if owls are not removed before the nesting season. Construction activities within the exclusion zones will be prohibited until after the nestlings have fledged.

(c) The construction right-of-way will be monitored to determine whether any burrows have been constructed or re-inhabited between the preconstruction surveys and the clearing of the construction right-of-way.

MPM 43 For the foxtail cactus, Mojave will transplant each individual cactus that cannot be protected by restricting the right-of-way using the technique applied by environmental monitors for the original Mojave pipeline, which involves excavating the entire plant, trimming the roots to stimulate production of new root tips, and replanting in the northwestern shade of creosote bush with the same orientation the cactus had prior to removal.

MPM 44 For Swainson's hawk, Mojave will implement the following measures:

(a) The preconstruction surveys of potential Swainson's hawk nesting habitat will be conducted in March at the beginning of the nesting season (March through July) and again 30 days before construction to identify active nests within 0.5 mile of the construction right-of-way. These survey results will be provided to the DFG for evaluation of each nest site.

(b) Following the preconstruction surveys but before construction, exclusion zones will be established around all known Swainson's hawk nest sites. The radius of the exclusion zone will be determined by consultation with the DFG who will review each nest site on a case by case basis. Construction-related activities, especially vehicle activity and equipment storage, will be prohibited within the exclusion zones until the nestlings have fledged.

(c) All nests within 0.5 mile of the construction right-of-way will be monitored throughout the construction period or the nesting season, whichever ends first. Nesting birds will be monitored for indications of distress or harassment caused by construction activities. The DFG will be notified if behavioral changes are observed.

MPM 45 For vernal pool fairy shrimp and vernal pool tadpole shrimp, Mojave will avoid natural northern claypan vernal pools and sandstone pools where feasible by minor route alignments and, where realignment is not feasible, implement the following measures:

(a) Exclusion zones will be established by flagging the perimeter of all pools in or adjacent to the construction right-of-way. All construction activities will be prohibited or minimized within the exclusion zones.

(b) Portions of vernal pools disturbed by construction as well as any surrounding areas that could influence the hydrology of the pools will be restored and recontoured.

(c) The topsoil from the floor of the vernal pools will be segregated and stored for subsequent replacement following trench closure. The trench fill will be compacted to restore impermeable conditions and the topsoil replaced to ensure that some if not all of the eggs in the topsoil will be returned to the pools for populating the vernal pools the next rainy season.

(d) In consultation with the FWS, impact on nonnatural ponding areas will be evaluated after additional field surveys are conducted during the appropriate season. Once the extent of the potential impact and the type of habitat affected are better defined, Mojave will prepare a mitigation plan that addresses onsite mitigation of impact on secondary habitats.

MPM 46 For the longhorn fairy shrimp, Mojave will implement the following measures:

(a) The preconstruction surveys will be performed on parcels in the Coast Ranges that were not accessible during the 1993 and 1994 field surveys to identify vernal pools and pools of standing water in sandstone outcrops (see table 5.6.3-2). If the surveys are performed when adult stages of longhorn fairy shrimp are not likely to be found, its presence will be assumed where suitable habitat is encountered.

(b) Northern claypan vernal pools and sandstone pools will be avoided where feasible by minor route realignments.

(c) Where realignment is not feasible, the mitigation measures would be the same as MPM 45.

(d) Where avoidance and/or restoration are deemed insufficient mitigation, compensatory acreage may be required. If construction-related activities result in the temporary loss of wetland habitat, a mitigation plan that includes habitat compensation will be prepared for review by the FWS. (See ARM 26 regarding site-specific vernal pool restoration plans.)

MPM 47 For the San Joaquin kit fox, Mojave will implement the following measures:

(a) The preconstruction surveys in areas identified as supporting good-, moderate-, or poor-quality San Joaquin kit fox habitat will be constructed within 30 days before starting construction activities to determine current kit fox occurrences along the proposed construction right-of-way. The results of these surveys will be presented to the FWS within two weeks of their completion. If an active den is discovered during the preconstruction surveys, the resource agencies will be notified, and appropriate compensation acreage will be determined.

(b) Following the preconstruction surveys but prior to construction, circular exclusion zones will be established around all known and potential dens, and construction activities, especially vehicle activity and equipment storage, will be prohibited or minimized within exclusion zones.

(c) Any known or potential kit fox dens within the construction right-of-way that cannot be avoided will be carefully destroyed following FWS protocol using hand tools until it is certain that the den is inactive.

MPM 48 For the Tipton kangaroo rat and short-nosed kangaroo rat, Mojave will implement the following measures:

(a) The preconstruction surveys will be conducted within 30 days before starting construction activities in order to update the status of the Tipton and short-nosed kangaroo rats within the construction right-of-way. These surveys will be conducted between Pixley and Tulare on the North Mainline simultaneously with the preconstruction surveys for San Joaquin kit fox.

(b) Following the preconstruction surveys but before construction, circular exclusion zones will be established around all known Tipton and Short-Nosed kangaroo rat burrows and prohibited or minimized construction activities, especially vehicle activity and equipment storage, will be within the exclusion zones.

(c) Any known Tipton and Short-Nosed kangaroo rat burrows within the construction right-of-way that could not be avoided will be carefully destroyed following FWS guidelines using hand tools until certain that the burrow is inactive.

(d) All pipes, culverts, and similar structures will be inspected before burying, capping, or otherwise installing in the trench.

MPM 49 For the blunt-nosed leopard lizard, Mojave will implement the following measures:

(a) The preconstruction surveys of blunt-nosed leopard lizard habitat will be conducted within 30 days before startup construction activities. Occupied habitat will be marked on the alignment sheets.

(b) Following the preconstruction surveys but before construction, circular exclusion zones will be established around all known leopard lizard burrows, and prohibited or minimized construction, especially vehicle activity and equipment storage, will be within the exclusion zones.

(c) Any known leopard lizard burrows within the construction right-of-way that could not be avoided will be carefully excavated following FWS protocol using hand tools until certain that the dens are inactive or the lizards escape.

(d) Open trenches in blunt-nosed leopard habitat will be inspected at least twice a day and immediately before backfilling. Lizards in trenches will be removed by the environmental monitors.

(e) The right-of-way will be inspected immediately before ground-disturbing activities for active blunt-nosed leopard lizard.

(f) If blunt-nose leopard lizards are observed in the right-of-way, they will be removed from the area before resuming construction-related activities.

(g) If construction occurs during active periods, i.e., when temperatures are between 75 to 95°F, the open trench will be inspected more frequently by the monitors. If construction occurs during inactive periods, i.e., when temperatures are below 75°F or above 95°F, increased emphasis will be placed on locating and avoiding or excavating known burrows.

MPM 50 For the giant garter snake, Mojave will implement the following measures:

(a) When possible, construction within occupied giant garter snake habitat will be avoided during the dormant season from October through March. Construction in April through September will be coordinated with the resource agencies.

(b) Stream and canal banks will be reconstructed in a manner that provides hibernacula for giant garter snake if approved by the party responsible for levy or bank management. Chunks of concrete rip-rap or other suitable material will be semiburied above the 100-year flood level.

(c) The construction right-of-way width will be restricted as much as possible within the riparian zone and wetland habitat.

(d) Excavation spoils will be placed in a designated area that is unlikely to be used by giant garter snake and will be replaced immediately or removed after construction is completed.

(e) If possible, the construction right-of-way will be cleared by mowing to a height of not less than 6 inches rather than by blading.

MPM 51 For the valley elderberry longhorn beetle, Mojave will implement the following measures:

(a) Impact on blue elderberry plants at Mill, Laguna, and Mosher Creeks will be avoided by minor realignments during the final survey of the construction right-of-way. A biologist will assist the surveyors in selecting an alignment that will minimize impact on suitable valley elderberry longhorn beetle habitat and in attempting to locate the edge of the right-of-way at least 20 feet from the dripline of each elderberry plant.

(b) If realignment is not feasible, the width of the construction right-of-way will be restricted in the vicinity of the elderberry plants

(c) Exclusionary fencing and warning signs will be placed around the stem clusters to avoid inadvertent damage to the plants.

(d) If the final survey of the construction right-of-way indicates that impact on suitable habitat would occur, a detailed assessment of the presence of Valley elderberry longhorn beetle and the quality of the habitat will be prepared. The assessment will include the precise location, height, and diameter of all elderberry shrubs, their general condition, and the presence or absence of adult exit holes. Mojave will then choose an alternative construction method that will avoid impact on the habitat or prepare a mitigation plan to compensate for the loss of habitat in consultation with the FWS. The plan will follow the FWS's 1994 "General Compensation Guidelines for the Valley Elderberry Longhorn Beetle."

MPM 52 For the recurved larkspur, Hoover's wooly star, and brittlescale, Mojave will implement the following measures:

(a) Where feasible, the construction right-of-way will be realigned to avoid populations of recurved larkspur.

(b) The preconstruction surveys will verify the exact location of a population of brittlescale on the North Mainline. If the population is in the proposed right-of-way, minor route realignments will be made where possible to avoid it.

(c) Exclusion zones with high visibility flagging will be established around all plants that will be avoided within or adjacent to the construction right-of-way. The zone will extend a minimum of 10 feet from the edge of the population or the dripline of individual plants.

(d) Seeds, cuttings, or entire plants will be collected from affected populations for subsequent replanting in the right-of-way. Should this prove infeasible, seed from a nearby population will be obtained and planted in an attempt to maintain the regional genetic pool. Known plant populations will be monitored throughout the growing season to identify the optimal time to collect seed or cuttings.

(e) The planting site will be graded to return it to its original contours.

(f) Topsoil will be segregated and stockpiled apart from subsoils for subsequent replacement.

(g) Success criteria (survivorship requirements) will be developed to measure the effectiveness of mitigation measures in protecting and ensuring the continued viability of the population.

(h) A multi-year monitoring program will be developed and implemented to verify successful impact mitigation.

MPM 53 For the Bakersfield cactus, Mojave will implement the following measures:

(a) Preconstruction surveys will be conducted to confirm that no new cactus plants have become established within the construction right-of-way.

(b) The construction right-of-way will be restricted in the vicinity of known populations where feasible. Where not feasible, individual cactus plants will be removed, held in a nursery until construction is complete, and transplanted to their original locations and orientations when climatic conditions are favorable. If it is impractical to transplant large plants, the cactus pads will be separated and planted in the right-of-way.

MPM 54 For the California tiger salamander, Mojave will implement the following measures:

(a) Before construction, a habitat analysis will be conducted to identify potential breeding habitat within 1 mile of the proposed route and measure ground squirrel burrow density within the construction right-of-way.

(b) If good-quality habitat is encountered, Mojave will attempt to realign the route to avoid the habitat and demonstrate to the satisfaction of the FWS and DFG that it has made a reasonable attempt to do so.

(c) Night surveys will be conducted to capture and relocate salamanders when adult salamanders are active around the mouths of burrows during the rainy season.

(d) Adult salamanders will be removed from the construction right-of-way by creating one-way drift fences around occupied habitat if the final right-of-way is surveyed before the rainy season. When the adult salamanders migrate to their reproductive wetland habitat, the burrows will be closed, and the salamanders will be prevented from returning by closing the openings in the drift fences.

(e) If the right-of-way is between the wetland breeding area and the burrows, construction activities will be delayed until after the breeding season.

(f) Occupied burrows will be excavated by hand if construction occurs when it is impossible to implement the above measures, and the presence or absence of adult salamanders will be confirmed with a portable fiber-optic scope prior to excavation. Captured salamanders will either be relocated to a wetland habitat or used for scientific research such as ongoing genetic studies or captive breeding programs.

MPM 55 For the California red-legged frog, Mojave will implement the following measures:

(a) The preconstruction surveys will identify occupied California red-legged frog habitat on the basis of the auditory response of frogs.

(b) Minor route realignments will be made to avoid areas where potential red-legged frog habitat has been identified.

(c) The construction right-of-way will be outside wetland habitat and the adjacent riparian zone that supports California red-legged frog wherever possible.

(d) Exclusion fencing will be used when wetland habitat is adjacent to the right-of-way.

(e) Disruption of breeding will be avoided by prohibiting construction within 1/8 mile of occupied wetland habitat during the breeding season from February through March.

(f) The monitoring of trenches will be increased during the rainy season to remove adult frogs that can become trapped as they move from wetland habitats to adjacent upland areas.

(g) Construction will be prohibited in occupied wetland habitat from January 15 though September 15 if avoidance of the habitat through realignment is impossible.

(h) If the temporary loss of occupied wetland habitat is unavoidable, a mitigation plan for habitat compensation will be prepared and incorporate the FWS mitigation guidelines, which include a sliding scale of habitat compensation ratios based on the number of years the compensation habitat is in place prior to project construction.

MPM 56 For the western pond turtle, Mojave will implement the following measures:

(a) Construction in wetland habitat will be minimized by minor route realignment or restricting the width of the construction right-of-way.

(b) The preconstruction surveys will be performed within 14 days of starting construction in areas that support suitable habitat for pond turtles to determine whether turtles are present within the construction right-of-way.

(c) Where occupied habitat cannot be avoided, turtles will be captured and relocated to suitable habitat.

(d) Once the turtles have been removed, drift fences will be placed along the edges of wetland habitat adjacent to the right-of-way to prevent adult turtles from returning.

(e) Stream, pond, and canal banks in occupied habitat will be reconstructed in a manner that will provide hibernacula and basking sites for pond turtles if approved by the party responsible for levy or bank management. Chunks of concrete rip-rap or other suitable materials will be semiburied above the 100-year flood level.

(f) The monitoring of trenches will be increased during the rainy season to remove adult turtles that can become trapped as they move from wetland habitats to adjacent upland areas.

(g) When possible, construction within occupied turtle habitat will be conducted during the active season from February through mid November. Any construction in occupied habitat outside this period will be authorized by the resource agencies.

MPM 57 For the Alameda whipsnake, Mojave will implement the following measures:

(a) Preconstruction surveys will be performed on parcels in the Coast Ranges that were not accessible during the 1993 and 1994 field surveys to identify occupied Alameda whipsnake habitat (see table 5.6.3-2). If the surveys are performed when Alameda whipsnake is likely to be inactive, its presence would be assumed where suitable habitat is encountered. If occupied Alameda whipsnake habitat is encountered during the surveys, the DFG would be consulted to evaluate impact and appropriate mitigation measures.

(b) If occupied habitat is found on the unsurveyed portions of the proposed route, compensation acreage for temporary habitat loss would be determined by agency consultation.

MPM 58 For the San Francisco garter snake, Mojave will implement the following measures:

(a) If possible, the Hunters Point Segment will be realigned to the west side of the Caltrans right-of-way between MP 18.35 and MP 18.55.

(b) The crossing of the Loma Alta Canal will be drilled.

MPM 59 For the golden eagle, Mojave will implement the following measures when pipeline construction occurs within potential golden eagle nesting habitat during the nesting season from March through July:

(a) The preconstruction surveys of potential golden eagle nesting habitat will be conducted at the beginning of the nesting season in March and again 30 days before construction to identify active nests within 0.5 mile of the construction right-of-way if construction would begin in the breeding season. The surveys results will be provided to the DFG for evaluation of each nest site.

(b) Following the preconstruction surveys but before construction, exclusion zones will be established around all active golden eagle nest sites. The radius of the exclusion zone will be determined by consultation with the DFG but will likely be 0.5 mile. Construction-related activities, especially vehicle activity and equipment storage, will be prohibited within the exclusion zones until the nestlings have fledged.

MPM 60 For the double-crested cormorant, during the preconstruction surveys, Mojave will verify the presence of a nesting colony of double-crested cormorant in Shell Marsh. If an active nesting colony is present, the DFG will be notified, and the status of the colony will be evaluated before construction can proceed.

MPM 61 For the Suisun song sparrow, Mojave will implement the following measures:

(a) If possible, all shrubs will be cleared from the construction right-of-way before the nesting season in order to prevent sparrows from selecting nest sites within the right-of-way.

(b) The preconstruction surveys will be conducted within 14 days of initiating construction to identify nests within the construction right-of-way. Any nests located within the right-of-way will be flagged and monitored. An exclusion zone with a 20-foot radius will be established around each nest.

MPM 62 For the heartscale, brittlescale, valley spearscale, and palmate-bracted bird's beak, Mojave will implement the following measures:

(a) The preconstruction surveys of inaccessible alkali lowland habitat will be performed during the appropriate flowering period to verify the presence of these species.

(b) If a population is discovered, reasonable attempts will be made to avoid as many individual plants as possible through minor realignments or restriction of the construction right-of-way.

(c) If it is not possible to avoid the entire population, the measures listed under MPM 52 for sensitive plant species in the Central Valley will be taken.

MPM 63 For the Santa Cruz tarplant and large-flowered fiddleneck, Mojave will implement the following measures:

(a) The preconstruction surveys of inaccessible nonnative grassland habitat will be performed during the appropriate flowering period to verify the presence of these species.

(b) If a population is discovered, reasonable attempts will be made to avoid as many individual plants as possible through minor realignments or restriction of the construction right-of-way.

(c) If it is not possible to avoid the entire population, the measures listed under MPM 52 for sensitive plant species in the Central Valley will be taken.

MPM 64 For the Contra Costa wallflower and Antioch Dunes evening primrose, Mojave will implement the following measures:

(a) If possible, the Antioch Segment will be realigned farther from the Antioch Dunes Ecological Reserve.

(b) Dust suppression measures will be increased in the vicinity of the preserve to prevent dust from accumulating on the plants.

(c) Plants growing on the boundary of the preserve will be flagged, and the width of the construction right-of-way will be restricted near these plants.

(d) An environmental monitor will be stationed along the boundary of the preserve whenever construction activities are in progress.

MPM 65 For the spiny-sepaled button celery, Mojave will restrict the width of the construction right-of-way in the vicinity of vernal pools containing spiny-sepaled button celery.

Land Use, Transportation, Recreation, and Visual Resources

MPM 66 For all residences within 50 feet of the construction work area, Mojave will:

(a) Reduce the size of work crews and equipment.

(b) Limit the hours of construction to times of low noise sensitivity, i.e., daylight hours.

(c) Minimize the size of the work space required and the length of time that the trench is left open by:

(i) Sewer-line/stove-pipe construction in which a limited length of trench is dug, a section of pipe is laid and welded into place, and that section of the trench is backfilled immediately.

(ii) Drag-section construction in which a separate work space is required for prefabrication of long pipeline segments. After the trench has been dug, the long pipeline segment is brought to and laid in the trench. It is welded in place, and the trench is backfilled.

MPM 67 To mitigate the impact on commercial/industrial areas, Mojave will provide steel grate access planks across the trench or right-of-way and time construction activities to avoid peak business periods.

MPM 68 Mojave will return land cleared by construction to its previous use as approved by the landowner, provide compensation for crop, orchard, and vineyard losses through easement agreements, and restore lawns and residential landscaping.

MPM 69 To mitigate the increased vehicle traffic on roads between the stockpile areas and the construction right-of-way, transportation routes and schedules for construction vehicles will be selected using the following criteria:

(a) Minimize trip length.

(b) Avoid roadways and bridges that cannot support frequent use by heavily-laden, multi-axle vehicles.

(c) Minimize traffic delays during loading and unloading at construction right-of-way access points.

MPM 70 To mitigate the adverse effects on traffic flow at open-cut crossings of county and local roads, Mojave will:

(a) Complete each crossing within one day including pipe installation, backfilling, cleanup, and restoration.

(b) Control or detour traffic in order to minimize delay and inconvenience and use safety measures including flag persons, barriers, warning signs, lights, and pedestrian walkways.

(c) Either keep all roads open and passable or construct a suitable bypass to keep traffic flowing at all times.

MPM 71 In areas where there would be in-street construction, Mojave will use traffic control measures including detours to minimize traffic delays.

MPM 72 Mojave will restore all trails and other recreational facilities crossed as well as revegetate disturbed soils so recreational use could resume. During construction, Mojave will maintain safe pedestrian access on the Ohlone Wilderness Trail or establish temporary detours to minimize inconvenience to trail users.

MPM 73 At the beginning of the Fremont Segment Mojave will install the block valve in a vault in the street.

MPM 74 Mojave will coordinate closely with CalTrans and the City of Fremont for any work in Fremont to ensure minimal conflict with the city's proposed transportation improvement projects at the Fremont Boulevard/Interstate 880 interchange and the utility relocation work at MP 3.1 on the proposed Fremont Segment in order to maintain the flow of traffic during construction.

MPM 75 To mitigate adverse effects on the high-volume traffic on Auto Mall Parkway during the day, Mojave will implement night construction hours if adverse effects on traffic could not be avoided by other measures during the construction of the proposed Fremont Segment between MP 4.6 and MP 7.2.

MPM 76 Mojave will consult with the Alameda County Water District to resolve the issue of the proposed Fremont Segment at MP 14.7 being constructed on a narrow strip of land atop a vertical embankment adjacent to a water supply pond and, if necessary, move the pipeline to the south side of the railroad.

MPM 77 Mojave will consult with BART to ensure that the proposed access road to the approved aboveground extension and station at MP 9.0 on the proposed Oakland Segment would not be affected by the pipeline north of Interstate 580.

MPM 78 Mojave will coordinate its engineering and construction schedule closely with the City of Dublin's publics works department in order for the Oakland Segment between MP 9.8 and MP 11.8 to be constructed where Dublin Boulevard will be widened in 1995.

MPM 79 Mojave will coordinate its construction operations to avoid interfering with ongoing or planned projects in the Cities of Redwood City, San Carlos, Mountain View, and Belmont and to ensure the least disruption. If insurmountable conflicts are encountered, route variations may be needed to avoid areas of proposed construction and utility space constraints.

MPM 80 Mojave will coordinate with the City of San Mateo to ensure that the pipeline would not create an obstacle to the City's proposed relocation of an existing CalTrain line and station from MP 13.0 to MP 13.3 on the proposed Hunters Point Segment.

MPM 81 To reduce impact on recreation and public interest areas, Mojave will:

(a) Realign the proposed pipeline route through sensitive recreation areas such as trails.

(b) Maintain public safety and hiker access on trails.

(c) Provide detours on trails during construction activities.

(d) Water dirt and gravel roads to reduce dust caused by construction equipment.

MPM 82 The mitigation measures that Mojave will implement to reduce visual impact would be of two general types: strategic location and disturbance minimization. The pipeline right-of-way will generally be within or adjacent to existing right-of-way to make maximum use of the existing topography and vegetation for screening. Near travel routes, the right-of-way will be concealed from highways and other areas of public view to the extent possible. Techniques to minimize visual disturbance are:

(a) During the clearing of right-of-way for the pipeline, curvilinear instead of straight-line boundaries would be created in areas of potentially permanent scenic impact on minimize disturbing the landscape. To the extent practicable, grading will be done in a manner that minimizes erosion and conforms to the natural topography.

(b) The clearing of trees and vegetation for the pipeline right-of-way will be limited to the minimum area required.

(c) To the extent possible, all foliage adjacent to the pipeline and compressor and meter stations will remain undisturbed to provide maximum screening.

(d) Oaks, cottonwoods, and other large native trees will not be removed if avoidable by minor realignment of the pipeline. To the maximum practicable extent, the soils within the root zones of these trees will not be disturbed.

(e) Trees that act as windbreaks and visual barriers along highways and railroad rights-of-way will be replanted or replaced following the approved site-specific revegetation plans.

(f) All other timber and vegetation without value will be mechanically chipped and spread in a manner that will aid seedling establishment and soil stabilization; however, because of potential conflicts with landowner requests, revegetation specifications, and other agency-imposed measures, this might not be possible in all situations.

(g) Soil excavated during construction will be evenly backfilled into the cleared area or removed from the site, and the area will be graded to conform with the terrain and the adjacent land.

(h) Dumping of excess material on downhill slopes will be minimized.

(i) Cut-and-fill slopes will be rounded to break sharp unnatural edges formed at the contact between the level slope and the rounded natural landform.

(j) Restoration and revegetation will be done as quickly as possible for soil stabilization and to reduce the color contrast between the right-of-way and adjacent vegetation. Grasses similar to the adjacent vegetation will be used where possible to ensure that the created visual pathway will blend as much as possible with the surrounding landscape.

(k) If revegetation and soil stabilization on steep slopes and in scenic areas are determined to be unsuccessful during postconstruction monitoring, further restoration efforts will be made.

(l) Aboveground facilities will be painted a uniform, noncontrasting color to blend with the surrounding natural environment as much as possible.

MPM 83 Mojave will spare large-diameter trees as much as possible in accordance with Stanford University's requirements by using more workspace on roads as opposed to adjacent wooded areas.

Cultural Resources

MPM 84 Through its Native American contact program, Mojave identified 25 sensitive areas and will monitor construction through them. As part of the cultural resources inventory report, Mojave submitted a plan for the treatment of human remains, cultural items, and other cultural resources that might be discovered during construction. This plan is currently being reviewed by the appropriate agencies.

Air Quality and Noise

MPM 85 To mitigate the impact of construction activities on air quality, Mojave will:

(a) Implement a dust control plan at all construction sites in compliance with all Federal, state, and local rules and regulations regarding the control of fugitive dust and respirable particulates.

(b) Control fugitive dust during construction activities by limiting the amount of right-of-way subjected to surface disturbance, by maintaining reduced speed limits, and, if necessary, by watering the right-of-way.

(c) When directed by the authorized officer, use dust control measures on all roads when dust creates a nuisance, safety hazard, or damage to the existing road. Mojave has not proposed the utilization of fugitive dust suppressant fluids other than fresh water. Use of nonaqueous dust suppressants such as chlorides, oils, and other chemicals will require prior approval of the authorized officer with specific approval notification to the contractor, in writing, by the site construction manager.

(d) Instruct the contractor not to handle or store materials, use a road, or construct, alter, or repair any equipment without taking reasonable precautions to prevent particulate matter from becoming airborne and creating nuisance conditions. Such precautions will include:

(i) Where necessary, using fresh water to control dust during construction, operation, grading of roads, or clearing of land and rights-of-way.

(ii) Applying fresh water on unpaved roads, material stockpiles, and other surfaces that could create excessive airborne particulates as a result of construction activities.

(iii) Fully or partially enclosing material stockpiles where application of fresh water would not be sufficient to prevent particulate matter from becoming airborne.

(iv) Matting consolidated rock blasting operations where required.

(v) Covering open-bodied trucks transporting materials that could become airborne when the trucks are in motion.

(vi) Promptly removing from paved roads earth or other materials that could become airborne.

MPM 86 To mitigate the impact on air quality from compressor station emissions during operation, Mojave will:

(a) Obtain required permits.

(b) Use Best Available Control Technology.

(c) Use electric-motor-driven compressors at Daggett and Lindsay.

MPM 87 To mitigate the noise impact of compressor station construction, Mojave will:

(a) Limit construction to daytime hours.

(b) Use proper equipment operating techniques and manufacturer-installed noise abatement equipment.

To mitigate the noise impact of compressor station operation, Mojave will:

(a) Install intake and exhaust silencers on the natural-gas-turbine-driven compressors.

(b) House the natural-gas-turbine-driven and electric-motor-driven compressor units in buildings.

(c) Install acoustical insulation inside the buildings if required.

(d) Construct exterior noise barrier walls if required.

Reliability and Safety

MPM 88 Mojave will implement the safety features listed in table 5.11.3-1.

MPM 89 Mojave will design, construct, operate, and maintain the proposed project in accordance with the DOT Minimum Federal Safety Standards (49 CFR 192), which were described above. General construction safety standards will be met. Mojave's SPCC Plan will also be followed during construction (see Resource-Specific Condition 25). The pipeline will be operated in accordance with Federal and state occupational safety and health regulations including specific requirements for confined space entry, fire prevention, evacuation, hazard communication, hazardous materials emergency response, and personal protective equipment.

MPM 90 Mojave's existing O&M program will be expanded to cover the proposed project. Mojave also has an existing pipeline damage control program that includes corrosion control and leak surveys and that would be expanded to cover the proposed project.

MPM 91 Mojave will mark the locations of their underground facilities, continue to participate in the One-Call program, and provide onsite inspection of construction activities that could impact the pipeline.

MPM 92 All pipeline block valves in heavily populated areas will be fitted with automatic line-break control devices, which would shut off the supply of gas if the pipeline were punctured or broken. All pipeline control valves at meter locations and block valves in critical locations could be closed remotely by personnel at the Gas Control Center where pressure and volume changes would be detected.

MPM 93 Mojave's Gas Control Center will be manned 24 hours per day, seven days per week. The control system will include redundant control computers, redundant power supplies, and redundant communication links to the meter stations along the pipeline. A relational database will store real-time flow, pressure, and temperature measurements and provide on-line reports or responses to ad-hoc queries by pipeline operators. When the measured pressures deviate from computer-predicted pressures, the operator will receive an alarm.

MPM 94 Every meter station will have redundant power supplies and redundant communication links to the Gas Control Center in Bakersfield.

MPM 95 Mojave's O&M personnel will continue to be trained in leak detection and emergency shutdown and blowoff procedures to stop the flow of gas and reduce line pressure in an emergency.

MPM 96 Mojave's existing emergency plan will be updated to cover the proposed project.

MPM 97 Mojave will maintain its 24-hour emergency response capabilities and accept collect calls to its emergency-only phone number, which is manned 24 hours a day. The number will be posted on all pipeline markers and provided to all local emergency services agencies.

MPM 98 Mojave will meet with all local emergency service agencies before the proposed project begins operation and would provide a written description of the system. Mojave will also meet with all local emergency service agencies on an annual basis.

MPM 99 If local fire departments require additional training or special equipment because of the proposed project, Mojave will assist and coordinate the additional training and identification of vendors of special equipment.

MPM 100 Mojave has prepared a General Contingency Plan for all areas where there is a reasonable potential for contamination including areas where contaminated sites have been identified within shallow groundwater zones or within a 400-foot-wide corridor along the route. The General Contingency Plan identifies measures and precautions to take should stained soils be observed or odorous conditions detected during construction activities. If soil or groundwater contamination is encountered or suspected:

(a) The construction crew will stop work, move away from the area, and follow the Contractor's Health and Safety Plan, which will comply with the personnel protection requirements of Title 29, CFR, Section 1910.120.

(b) Personnel trained and equipped for the handling of petroleum-contaminated soils will excavate and stockpile the contaminated soil. Representative samples from the stockpiled materials will be analyzed by trained and equipped personnel for petroleum contaminants including total petroleum hydrocarbons, benzene, toluene, ethylbenzene, and xylene.

MPM 101 The California Environmental Protection Agency's Department of Toxic Substances Control will permit Mojave to return contaminated soil to the trench under the following conditions:

(a) Mojave will implement appropriate health and safety precautions to protect its employees and the public and to prevent or minimize any exposure to potentially hazardous substances.

(b) Mojave will determine the nature of the contaminant and assess the compatibility of the contaminant with the equipment that is being installed; Mojave would not install equipment in an area with incompatible contaminants.

(c) Excavated soils will be deposited back into the original excavation whenever possible.

(d) Excavated soils will be deposited so that only clean soil will be exposed at the surface of the filled excavation.

(e) All displaced soil, i.e., soil that could not be placed back into the excavation, will be assessed to determine whether it exhibits a characteristic specified in Title 22, California Code of Regulations, Chapter 11.

(f) If the displaced soil is determined to be a hazardous waste, it will be managed in accordance with all applicable Federal and state hazardous waste laws and regulations.

(g) Excavated soil not replaced in the excavation by the end of the day will be covered with visqueen; this will be done to prevent potential migration of contamination due to storm runoff.

(h) Contaminated soil will not be moved outside the area of contamination.

MPM 102 In addition to the conditions that Mojave has agreed to meet when returning contaminated soil to its original location, DTSC will require that Mojave provide written notification, all test results, and the location of the potentially contaminated soil to the landowner as well as DTSC.

MPM 103 To mitigate any excess contaminated soil that could not be returned to the trench, Mojave will:

(a) Dispose of the soil at an approved treatment or disposal facility.

(b) Aerate it on- or offsite, if permitted, to remove any volatile organic contaminants from the soil.

(c) Reroute the pipeline to avoid a potentially contaminated area.

MPM 104 Mojave will pump and treat any contaminated groundwater and discharge the treated water to the sanitary sewer or storm drain with appropriate permits.

MPM 105 All equipment that contacts potentially contaminated soil will be decontaminated by steamcleaning before leaving the site, and the decontamination condensate/washwater will be properly disposed.

MPM 106 Before blasting Mojave will:

(a) Obtain all necessary permits and authorizations.

(b) Use flagpersons on roads near blasting sites to control traffic.

(c) Use matting to protect property.

(d) Notify nearby residents.

(e) Blast only during daylight hours.

APPENDIX A

EROSION CONTROL, REVEGETATION, AND MAINTENANCE PLAN

I. SUPERVISION AND INSPECTION

This plan requires that judgment be applied in the field and must be implemented under the supervision of the Environmental Inspector(s) or other qualified professional(s) with knowledge of soil conditions and conservation plantings in the project area. All non-wetland areas disturbed by construction shall be treated in accordance with the appropriate portions of this Erosion Control, Revegetation, and Maintenance Plan (Plan). Deviations that involve less protective measures will only be permitted as certificated by the Commission or by the written approval of the Director of the Office of Pipeline Regulation, or his designee, upon an appropriate showing of need after project authorization, unless specifically required by the Federal, state, or Native American land-managing agency for the portion of the project on its land.

At least one Environmental Inspector is required for each construction spread used during construction. Environmental Inspectors shall have direct responsibility to enforce the following requirements. They shall have peer status with all other activity inspectors. Problems with contractor compliance shall be reported to the Environmental Inspector(s) for remedial action and Environmental Inspector(s) shall have the authority to order correction of acts that violate the environmental conditions of the FERC certificate authorization. The duties of the Environmental Inspector(s) include monitoring and/or supervision of the following:

A. Compliance with the requirements of this Plan, the Wetland and Waterbody Construction and Mitigation Procedures (**Procedures**), environmental conditions of the FERC certificate authorization, and other environmental permits and approvals;

B. Marking of surface and subsurface drainage and irrigation system locations;

C. Identification of stabilization needs in all areas;

D. Performance of appropriate tests of subsoil and topsoil to determine the extent of compaction across the disturbed right-of-way in agricultural areas;

E. Restoration of the soil profile as required;

F. Approval of imported soils used as fill and/or additional cover material in agricultural areas;

G. Documentation of the implementation of the temporary and permanent erosion control and revegetation programs during construction; and

H. Setting up a program for monitoring of crop productivity and success of revegetation measures for not less than 2 years to determine the success of the restoration and the need for additional restoration where restoration is unsuccessful, and preparation of activity reports not less than quarterly during this period documenting problems identified by company personnel and/or landowners, and solutions identified and implemented. This monitoring program may be transferred to the company's operating section upon completion of construction and restoration activities.

Within 30 days of the in-service date for the facilities, a summary report shall be prepared and filed with the Commission detailing the following:

1. quantity and type of fertilizer, seed and mulch used for each pipeline segment;
2. the amount of lime applied (if required);
3. the equipment used to implement this plan;
4. the acreage treated:
5. the dates of backfilling and seeding;
6. the number of landowners specifying other seeding requirements and a description of the requirements; and
7. if the in-service date precedes the seeding season, the materials and equipment to be used, and the dates for future seeding as well as the temporary stabilization measures to be used until permanent seeding takes place.

II. PRECONSTRUCTION PLANNING

A. Contact landowners prior to construction to locate all fields containing drainage tiles and irrigation systems.

B. Undertake an assessment of vegetation requirements for screening and landscaping of new compression, metering, and other major aboveground (e.g., LNG plants) facilities. A report shall be submitted to the Commission for review and approval prior to construction.

C. Develop grazing deferment plans with willing landowners and grazing permittees to minimize grazing disturbance of revegetation efforts.

D. Locate all roadway crossings/access points to ensure that safe and accessible conditions exist throughout the construction phase. Use of 50-foot-long crushed stone access pads, sweeping, culvert installation, matting and other forms of rutting protection shall be required subject to local permit conditions. If crushed stone access pads are used, stone shall be placed on a synthetic fabric in active agricultural areas to facilitate stone removal.

III. CLEARING AND INSTALLATION

A. For pipelines larger than 12-inch-nominal diameter prevent the mixing of topsoil with subsoil by using topsoil segregation construction methods in annually cultivated or rotated agricultural lands (except pasture), in residential areas, and in other areas at the landowner's request. Topsoil shall be stripped from either the full work area or from the trench and subsoil storage area (ditch plus spoilside method). In residential areas, topsoil replacement is an acceptable alternative to topsoil segregation. For deep soils in agricultural lands (e.g., on floodplains and waterbody terraces), 12 inches of topsoil shall be segregated. Where soils are shallow or have a stony subsoil, 8 inches of topsoil segregation is recommended. If the amount of topsoil covering an area is less than the stated depth requirement, every effort should be made to segregate the existing topsoil layer. Make diligent efforts to remove stones greater than 4 inches from all segregated topsoil.

B. The nominal construction right-of-way width shall be limited to no more than 75 feet. However, additional construction right-of-way width may be used (subject to compliance with all applicable survey and mitigation requirements) in areas such as steep slopes and staging areas where necessary to ensure safe construction or for topsoil storage. The maximum construction right-of-way width shall be less than 100 feet, unless topographic conditions in a side-slope area require a wider construction right-of-way in limited areas.

C. Probe all drainage systems with a sewer rod or pipe snake to determine if damage has occurred. All tiles damaged during construction shall be flagged by the trench inspector, then repaired to their original or better condition. Filter-covered drain tiles should only be used after consultation with the local soil conservation authorities. Qualified specialists shall be used to ensure proper repairs and adequate probing/testing of the repaired drainage systems.

D. Maintain water flow in crop irrigation systems, unless shutoff is coordinated with affected parties.

E. Contact landowners and local soil conservation authorities to determine future drain tile locations. Increase depth of cover over the pipeline to 4 feet or more for new pipelines, if needed, so the pipeline is below the anticipated depth of drain tile installations that are likely to occur within 3 years of the proposed construction. For pipeline loops in agricultural areas, the new pipeline shall be installed with at least the same depth of cover as the existing pipeline(s).

F. Construct temporary slope breakers using the written recommendations of the local soil conservation authorities. In the absence of these recommendations, install temporary slope breakers at the following spacing:

Slope (%)	Spacing (ft)
5 - 15	300
>15 - 30	200
>30	100

The outfall of all temporary slope breakers shall be directed toward appropriate energy-dissipating devices and off the construction right-of-way, if possible. Temporary slope breakers shall be inspected daily and repaired as necessary, to ensure they are functional and prevent erosion of the construction right-of-way.

G. Use temporary sediment barriers, such as silt fences and/or staked hay/straw bales, at the base of slopes adjacent to road crossings where vegetation has been disturbed within the following distances from the road:

Slope (%)	Minimum Undisturbed Ground Cover (ft)
< 5	25
5-15	50
>15-30	75
>30	100

These temporary sediment barriers shall remain in-place until permanent revegetation measures have been judged successful by the Environmental Inspector.

H. Use temporary sediment barriers, such as silt fences and/or staked hay/straw bales, at the base of slopes at all waterbody crossings (as required in the **Procedures**) and at the edge of the right-of-way to prevent siltation of farm ponds or other waterbodies downslope of the construction right-of-way. These temporary sediment barriers should remain in place until permanent revegetation measures have been judged successful by the Environmental Inspector.

I. The need for and spacing of trench breakers shall be determined on a project-specific basis by a qualified professional or shall be installed at the same spacing as permanent slope breakers. Trench breakers shall always be used on slopes adjacent to waterbodies and/or wetlands, and shall be located at the spacing required for permanent slope breakers. If the services of a qualified professional are not used to determine the need for them, trench breakers shall be installed in agricultural fields and residential areas at the same spacing as if permanent slope breakers were required. The use of topsoil in trench breakers shall be prohibited.

IV. CLEANUP

A. Every effort shall be made to complete final clean-up (including final grading) and the installation of permanent erosion control measures within 10 days after the trench is backfilled. A travel lane may be left open to allow for access by construction traffic. This travel lane shall be restored in accordance with this plan when access for construction or revegetation of the construction right-of-way is no longer required. If final clean-up of the construction right-of-way cannot be completed within 10 days of backfilling, all required temporary erosion control structures shall be installed and maintained in accordance with section V.B. this Plan and final clean-up shall be completed by the end of the next recommended seeding season for permanent vegetation.

B. Blast rock may be used to backfill the trench to the top of the existing bedrock profile. Make diligent efforts to remove rock larger than 4 inches from at least the top 12 inches of soil in all rotated and permanent cropland and hayfields, as well as residential areas, pastures, and other areas at the landowner's request, unless the landowner agrees, in writing, to other rock size provisions.

C. Test for soil compaction, in both the topsoil and subsoil, across the project right-of-way in agricultural areas. These tests shall be conducted at intervals sufficient to determine the need for remedial measures. Tests shall be done on the same soil type under the similar moisture conditions and should include the following areas:

1. soil from undisturbed areas;
2. soil stockpile areas;
3. the trenched zone;
4. the work area; and
5. any traffic areas related to the project.

U.S. Army Corps of Engineers-style cone penetrometers or other appropriate devices may be used to test for compaction.

D. Plow severely compacted or rutted agricultural areas with a paraplow or other deep tillage implement, or arrange with the landowner to plant and plow under a "green manure" crop, such as alfalfa, to decrease soil bulk density and improve soil structure. If plowing is employed, the stripped construction right-of-way shall be plowed first, followed by replacement of the segregated topsoil. Where necessary, additional plowing of the topsoil will be undertaken to prevent subsurface compaction. If subsequent construction and cleanup activities result in further compaction, additional tilling will be done.

E. Remove construction debris from the right-of-way and grade it to leave the soil in the proper condition for planting.

F. Permanent slope breakers shall be constructed and maintained in all areas, except cultivated areas and lawns, using the recommendations obtained from the local soil conservation authority. Divert concentrations of surface flow to a stabilized outlet using slope breakers with a 2 to 8 percent outslope directed toward appropriate energy-dissipating devices located off the right-of-way.

G. Restore all turf, ornamental shrubs, and other landscaping in accordance with the landowner's request, or compensate the landowner in an amount equal to replacement of the damaged landscaping. Restoration work shall be performed by a contractor or company personnel familiar with local horticultural and turf establishment practices.

V. REVEGETATION

A. GENERAL REQUIREMENTS

1. Obtain the written recommendations of the local soil conservation authorities regarding the need for and the amount of fertilizer and soil pH modifying agents. These materials are to be applied in accordance with the written

recommendations obtained. If manure is applied, the nitrogen application shall be reduced by half for each 10 tones/acre of manure applied. Where possible, incorporate soil pH modifying agents and fertilizer into the top 2 inches of soil.

2. Prepare a seedbed in disturbed areas to a depth of 3 to 4 inches using appropriate equipment to provide a firm seedbed. If hydroseeding is to be done, scarify the seedbed to facilitate lodging and germination of seed.

3. The project area should be seeded in accordance with written recommendations on seeding mixes, rates, and dates obtained from the local soil conservation authority. Alternative seed mixes specifically requested by the landowner or land-managing agency may be used. Any soil disturbance that occurs outside of the recommended permanent seeding season or any bare soil left unstabilized by vegetation shall be treated as a winter construction problem and mulched in accordance with section V.D. of this Plan. Except in lawns, all seeding of permanent cover should be done within the recommended seeding dates. If seeding cannot be done within those dates, temporary erosion control measures shall be used and seeding of permanent cover shall be done at the beginning of the next recommended seeding season.

4. Seed slopes steeper than 33 percent immediately after final grading, weather permitting, subject to the limitations addressed in section V.A.3 of this Plan.

5. **Seed rights-of-way within 6 working days of final grading**, weather and soil conditions permitting, subject to the limitations addressed in section V.A.3 of this Plan.

6. Develop specific procedures in coordination with the appropriate agency to prevent the introduction or spread of noxious weeds and soil pests resulting from construction and restoration activities.

B. TEMPORARY EROSION CONTROL

1. In the event that final cleanup is deferred more than 10 days after the trench is backfilled, all slopes adjacent to wetlands and waterbodies shall be mulched with 3 tons/acre of hay or straw, or its equivalent, for a minimum of 100 feet on each side of the wetland or waterbody. Mulch other areas as described in section V.D. of this Plan. The mulch shall be anchored with a mulch anchoring tool, as discussed in section V.D. of this Plan.

2. Consult the local soil conservation authorities to determine the appropriate temporary seeding, fertilizer, and soil pH modifier requirements. Fertilize and add appropriate soil pH modifiers to temporary plantings in accordance with the written recommendations of the local soil conservation authority. Where possible, incorporate soil pH modifier and fertilizer into the top 2 inches of soil.

3. All temporary erosion control structures required by sections III.F through III.H of this Plan shall be installed and maintained.

C. SEED SPECIFICATIONS

1. Purchase seed in accordance with the Pure Live Seed (PLS) specifications for seed mixes.

2. Use seed within 12 months of testing.

3. Treat legume seed with an inoculant specific to the species. For conventional seeding, use 4 times the manufacturer's recommended rate of inoculant, and 10 times the recommended rate if hydroseeding methods are being used.

4. Uniformly apply and cover seed in accordance with the written recommendations of the local soil conservation authorities. A seed drill equipped with a cultipacker is preferred for application, but broadcast or hydroseeding can be used at double the recommended seeding rates. Where broadcast seeding is used, firm the seedbed with a cultipacker or roller after seeding.

D. MULCH SPECIFICATIONS

1. Mulch all dry sandy sites and all slopes greater than 8 percent with 2 tons/acre of straw or hay or its equivalent, unless the local soil conservation authority specifically recommends otherwise in writing. Spread mulch uniformly over the area so that at least 75 percent of the ground surface is covered. If a mulch blower is used, the strands shall not be shredded less than 8 inches in length to allow anchoring.

2. Anchor mulch immediately after placing to minimize loss by wind and water. Use a mulch anchoring tool, which is a series of straight notched disks specifically designed for the purpose, to crimp the mulch to a depth of 2 to 3 inches. A regular farm disc should not be used.

3. Mulch may also be anchored using a liquid mulch binder, except within 100 feet of wetlands or waterbodies. Cutback asphalt (rapid or medium curing), or emulsified asphalt applied at 200 gallons/acre may be used. Synthetic binders should be used at rates recommended by the manufacturer. Use caution in residential areas or areas of pedestrian traffic, because asphaltic and some synthetic binders can damage shoes, clothing, and automobile paint.

4. Use jute thatching or bonded fiber blankets (instead of straw or hay) on banks of waterbodies to stabilize seeded areas. Anchor the thatching with pegs or staples.

5. Up to 1 ton/acre of wood chips may be added as mulch if areas so mulched are top-dressed with 11 lbs/acre available nitrogen or a similar quantity of

50 percent slow-release fertilizer.

VI. OFF-ROAD VEHICLE CONTROL

To each landowner and manager of forest lands, offer to install and maintain the following off-road vehicle control measures and install one or more of them, as requested, at the completion of clean-up and reseeding, or as appropriate prior to the completion of clean-up and reseeding:

A. Install a locking, heavy steel gate with fencing extending a reasonable distance to prevent bypassing the gate, and post appropriate signs. A gate may be used in conjunction with the screening requirements of section VI.B of this Plan.

B. Plant conifers or other appropriate shallow-rooted trees and/or shrubs across the right-of-way. The spacing of trees and/or shrubs and length of right-of-way planted should make a reasonable effort to inhibit unauthorized vehicle access and to screen the right-of-way from view.

C. Install a slash and timber barrier, a pipe barrier, or a line of boulders across the right-of-way to limit unauthorized vehicle access.

D. Post appropriate signs at all points of access and along the right-of-way at intervals not to exceed 2,000 feet to restrict unauthorized use of the right-of-way. An example sign may say "This Area Seeded for Wildlife Benefits and Erosion Control. This Pipeline Right-of-Way is NOT Public Property."

VII. MAINTENANCE

A. Follow-up inspections shall occur after the first and second growing season, normally 3 to 9 months and 15 to 21 months after planting, respectively, to determine the success of revegetation. Revegetation shall be considered successful if non-nuisance vegetation is similar in density to adjacent undisturbed lands, based on representative random sampling in the field (e.g., visual survey). If vegetative cover is considered unsuccessful or if there is a need for noxious weed control measures, the judgment of a professional agronomist shall be used to determine the need for additional restoration measures (such as fertilizing or reseeding) based on site conditions, and those actions shall be undertaken as recommended by this agronomist.

B. Routine right-of-way vegetation maintenance clearing shall not be done more frequently than every 3 years. However, to facilitate periodic corrosion/leak surveys, a corridor centered on the pipeline up to 10 feet wide may be maintained annually in a herbaceous state. In neither case shall maintenance clearing occur between April 15 and August 1 of any year.

C. Efforts to control off-road vehicle use, in cooperation with the landowner, shall continue throughout the life of the project. Signs, gates, and vehicle trails shall be maintained as necessary.

D. Monitor and correct problems with drainage and irrigation systems resulting from pipeline construction in active agricultural areas.

APPENDIX B

PROJECT REVEGETATION REQUIREMENTS

1.0 INTRODUCTION

This revegetation plan for the Mojave Northward Expansion project provides the procedures for reclamation and revegetation of areas disturbed by construction of the pipeline. This plan consists of practical and cost-effective procedures that are expected to optimize reclamation and revegetation success.

The revegetation procedures described in this plan are designed to accomplish the following objectives:

- Restore the natural habitats to their pre-construction conditions as quickly and efficiently as practicable;
- Provide contemporaneous and post pipeline construction surface stabilization and erosion control;
- Reestablish indigenous or other suitable vegetation;
- Conserve and protect sensitive species and their habitats through reclamation procedures which optimize natural regeneration processes and through revegetation with indigenous plant species.
- Comply with the regulatory requirements of the FERC staff's Erosion Control, Revegetation, and Maintenance Plan (Plan) and Wetland and Waterbody Construction and Mitigation Procedures (Procedures) and other applicable agency requirements.

The revegetation plan addresses revegetation of all of the natural communities affected by the proposed alignment, including Mojave scrub, nonnative grasslands, chenopod scrub, foothill woodlands, and wetlands. The wetlands include riparian communities, seasonal wetlands, vernal pools, nonnatural ponding areas, alkali lowland communities, and coastal brackish water marshes. It does not address revegetation of reclamation in human-influenced habitats, such as agricultural, rural residential, or urban/industrial lands. Application of this plan is subject to individual landowner approval. Proposed changes to the revegetation plan are subject to the approval of the FERC and the SLC. Rights-of-way and other disturbed lands that are currently maintained in conditions approximating natural or nonnative grasslands would follow the revegetation plans for non-native grasslands as discussed within this plan.

The program establishes guidelines for topsoil salvage and replacement, seedbed preparation, mulch, seed mixes, plant materials, and planting methodologies. Revegetation methods applicable to different habitats and site conditions are described, and maintenance and monitoring guidelines following the FERC and the State of California requirements are provided.

The procedures discussed in this plan were developed in consultation with private, federal, and state agency personnel and revegetation specialists, as well as from a review of existing literature and similar reclamation efforts. Soil conservationists from the Soil Conservation Service (SCS), as well as the SCS Technical Guide and Revegetation Specifications were consulted for recommendations on seed mixes and plant species lists, and these recommendations were used as a basis for developing habitat-specific seed mixes and seeding rates. Due to the uniqueness of the individual habitat types, as well as the potential to conserve and protect habitat for sensitive species, these lists were revised or expanded to include a greater variety of native plant species naturally occurring in each habitat. The experience gained in the revegetation efforts for the original Mojave Pipeline project was also used to a large extent in the development of this plan. Biological reports on sensitive plant species and plant communities along the proposed route were also consulted in the development of this plan (Woodward-Clyde Consultants, 1993, 1994).

1.1 ENVIRONMENTAL CONSIDERATIONS

The success of the revegetation effort would be helped by minimizing the areas affected during construction, particularly in the arid southern San Joaquin and Mojave Desert areas. Adverse impacts to the topography, soils, vegetation, and wildlife along the Northward Expansion route would be avoided and/or lessened by:

- The appropriate siting of the right-of-way route and facilities;
- Making the construction right-of-way only as wide as necessary;
- Salvage of topsoil;
- Salvage of plant materials, where practical and appropriate; and
- Timing the activities to lessen surface impacts, where practical and appropriate.

Efforts have been made during project design to adjust the route to avoid sensitive habitats. For example, the route has been designed to avoid impacts to vernal pools, sensitive wetland habitats located within the grassland community. This relocation of activities and facilities to less sensitive lands reduces the overall magnitude of impact and the level of effort required to mitigate the impacts that do occur. Additional minor re-routes to avoid sensitive lands would be implemented during actual construction, as part of a continuous process of refinement.

Topsoil salvage and replacement followed by seeding would be the primary method of revegetation for the Mojave Northward Expansion project. This construction and restoration process would greatly assist in the rapid recovery of the disturbed habitats because topsoil is the superior germination and growth medium in the soil profile and contains plant establishment-promoting organic matter, such as viable seeds, nutrients, and macro- and micro-biota. The "seedbank" contained in the topsoil provides a valuable source of seed and nutrients naturally adapted to the specific site. The seeding is designed to provide a "jump-start" to the revegetation process to allow disturbed right-of-way to stabilize as quickly as possible.

In addition to the salvage of topsoil and the subsequent seeding of the right-of-way, the salvage of existing live plant materials and planting of cuttings or containerized plants would also be components of the revegetation program, particularly in the sensitive riparian, wetland, and desert habitats. Plant materials from which cuttings can be taken or which transplant readily would be stored temporarily on-site, and replanted immediately following construction activities.

Additional measures to be taken during construction to minimize surface disturbance and other construction impacts include:

- Existing access roads and adjacent disturbed right-of-ways would be used where feasible for travel, equipment storage, and portions of the new right-of-way;
- Off-road vehicle travel would be prohibited during construction and would be discouraged following construction through signage, and as necessary through the construction of berms or physical barriers.
- Staging areas, additional spoil storage areas, and other work areas would be at least 50 feet away from the edge of waterbodies or other sensitive habitats. If topographic conditions do not permit a 50-foot setback, then these areas must be at least 10 feet away. Additionally, prior approval must be received from the FERC and the SLC.
- Hazardous materials, chemicals, fuels, oils, and other materials would not be stored within 100 feet of wetlands, waterbodies or other sensitive habitats (such as vernal pools).
- Construction equipment would be refueled at least 100 feet away from wetlands, waterbodies, and other sensitive habitats.

2.0 REVEGETATION PROGRAM

2.1 INTRODUCTION

The revegetation program for the Northward Expansion project consists of general principles for site preparation, including right-of-way clearing, grading and soil replacement, and erosion control, seedbed preparation and seeding, planting, maintenance, and monitoring. Specific guidelines are included for each of the natural habitat type crossed by the proposed route. These guidelines may be modified by the revegetation specialist(s) during implementation to address the various sub-communities and microhabitats that occur along the proposed route. These modifications may include additions or substitutions to the species lists or seeding rates, and the requirement for planting or transplanting of container plants in site specific locations. Prior to the implementation of any modifications to this revegetation plan, approval must be received from both the FERC and the SLC.

Topsoil salvage and replacement, followed by seeding will be the primary method of revegetation for the Mojave Northward Expansion project. Planting of containerized plants or cuttings, and transplanting of salvaged plant materials, may be used in limited areas (i.e. Mojave scrub, foothill woodland, and/or riparian woodland habitats) in order to minimize visual impacts and for conservation of sensitive plant materials. These methods are discussed in more detail in the sections pertaining to each habitat type.

Minimizing the clearing of existing vegetation, landform recontouring, and in some instances the use of a land imprinting device, will be used in the revegetation program to help ensure the successful recovery of the habitats.

2.2 SITE PREPARATION

Site preparation includes methodologies for right-of-way clearing, grading, topsoil salvage and replacement, discing, and erosion control.

2.2.1 Clearing, Grading, and Soil Replacement

Clearing or blading will be limited to the right-of-way and other approved temporary work areas. In some areas, the right-of-way will be constricted to avoid specific sensitive resources (such as vernal pool habitats). The depth of blading will be minimized where possible in scrub communities, leaving root crowns intact, which will enable some species to stump-sprout and recover more quickly.

On portions of the right-of-way that will require revegetation, the topsoil and subsoil (spoil) from the trench will be excavated, stockpiled separately, and replaced. Between 8 to 12 inches of topsoil will be removed in areas that require topsoil segregation. In areas with sensitive plantings (i.e. Joshua trees or yuccas), the surface vegetation will be stockpiled in windrows on the spoil side of the right-of-way (non-working side of the trench). If the topsoil available on site is less than 8 inches, then only the topsoil will be segregated to minimize the potential for topsoil/subsoil mixing. The topsoil (which for the purposes of this plan include all surface material) will be removed during the first pass of clearing and grubbing activities in order to salvage both soil and seed. The right-of-way will not be cleared of vegetation prior to salvage activities. This surface material contains the "seedbank", and will provide a valuable source of seed for natural revegetation in addition to the proposed seeding. Cobbles and gravels, or other surface material such as desert pavement in Mojave scrub habitats, will be stockpiled in the same manner. Salvaged topsoil (and the seedbank stored in it) and other surface material will be stockpiled separately from the underlying subsoil (or spoil) removed during trenching, and will be respread over the entire right-of-way following backfilling of the trench.

The salvaging and handling of topsoil/surface material and their replacement in sequence will approximate the original soil profile. After installation of a sufficient length of pipe, the spoil from the trench will be backfilled in a manner avoiding contact with the topsoil surface material. The trench backfill will be compacted by driving a tracked vehicle over the trench. A slight crown will be left above the trench in flat terrain to compensate for future subsidence, and any extra spoil will be spread evenly to approximate the original contours. This excess spoil will not be mixed with topsoil. If it cannot be successfully graded back onto the right-of-way, excess subsoil will be disposed off site at an approved dump site. Landform contours and slopes along the proposed route will be returned during spoil placement as close as possible to pre-disturbance conditions, approximating the original contours. Erosion will be minimized by reducing slope length and angle where possible.

Grading and re-contouring in the vicinity of vernal pool, alkali wetland, and other wetland habitats will be accomplished in a manner that will not interrupt or alter the surface water flow patterns existing prior to the disturbance.

Following the replacement of spoil, topsoil/surface materials, including any rock, gravel, and plant debris, will be spread evenly across both the spoil area and the cleared right-of-way. This material is the superior germination and growth medium in the soil profile because it contains plant establishment-promoting organic matter, such as viable seeds, nutrients, and macro- and micro-biota. Its replacement will greatly assist in the rapid recovery of the disturbed habitats. The replacement of non-soil materials such as rock, gravel, and plant debris will provide for erosion control and create a microclimate for natural regeneration.

2.2.2 Discing

Construction areas, equipment storage areas, temporary access roads, or other areas to be revegetated in which soil compaction has occurred will be disced prior to the initiation of revegetation activities. Discing should be accomplished to a depth of approximately 12 inches. Areas to be disced will be identified by the revegetation specialist prior to the initiation of restoration activities.

2.2.3 Erosion Control

Erosion control measures will be used on slopes to control water erosion. Measures to be used include shallow retention and diversion structures and waterbars, which can retain surface water or direct flows across a disturbed slope to less erodible areas. Erosion control measures will be installed under the supervision of the environmental monitor or revegetation specialist, and will be implemented on an as-needed basis. The following erosion control measures are proposed for use:

- **Waterbars.** Waterbars will be constructed of compacted earthen materials and will be placed at an angle to the slope, (5-10% off perpendicular) with 2%-8% outslopes on permanent breakers. Drainage collected from the waterbar will be directed onto less steep, vegetated slopes. Waterbars will be constructed at intervals defined by length limits for spacing given a percent slope (Table 2-1). Permanent waterbars will not be taller than

24-36 inches in height. They will be constructed during backfilling and redistribution of subsoil/spoil and will be completed during the redistribution of topsoil.

Table 2-1

LENGTH LIMITS FOR WATERBAR SPACING

Slope (%)	Spacing (ft)[a]
5 - 15	300
15 - 30	200
>30	100

[a] Spacing between water bars can be reduced if environmental inspector identifies potential erosion problems.

Source: FERC Erosion Control, Revegetation, and Maintenance Plan.

- **Retention Devices**. Retention devices, such as checkdams in stream channels, sediment basins, and retentive waterbars may be used where appropriate during construction.
- **Diversion Structures**. Structures such as waterbars may be used in some instances to direct water from short slopes into planting basins, increasing available moisture for seeding and planting efforts.
- **Sediment Barriers**. Temporary sediment barriers, such as silt fences and/or staked hay or straw bales will be used at the base of slopes at all waterbody crossings and at the edge of the right-of-way to prevent siltation of waterbodies. Bales will be staked and positioned to control and divert sheet and minor channelized flows to desired outlets. These temporary barriers will remain in place until permanent revegetation has been deemed successful.
- **Erosion Control Fabrics**. Netting, straw mats, blankets, or other erosion control fabrics may be used on steep slopes or other appropriate areas to minimize erosion.

2.3 SEEDING AND PLANTING

Planting of seed and/or plant materials will occur in all habitats, in conjunction with topsoil salvage and replacement efforts. Seeding will be required for the right-of-way restoration through most of the natural communities traversed by the pipeline. Only the Mojave Desert natural communities would not be seeded. Containerized plantings and/or transplanting of existing plant materials, may also be performed, in addition to seeding in sensitive areas (i.e., foothill woodlands, and riparian corridors) and in high visibility areas such as regional parks. To ensure successful revegetation, the following techniques would be used:

- Seed and plant materials will be obtained from commercial vendors, or would be acquired from the right-of-way prior to disturbance.

- Right-of-way restoration would require the use of source material from local stock in certain habitats. Seed and plant materials collected from similar elevations and habitats in the same area would increase the chance for success. Species selection proposed in Section 2.4 includes local dominants and pioneer species indigenous to the area.

- Seeding and planting will be timed to provide the greatest chance of survival. Individual plants that are windrowed during construction will be planted immediately following restoration and deep watered. Herbaceous grasses and forbs would be seeded prior to the onset of the fall rains. Woody vegetation would be planted either in seed form or as containerized plants or cuttings. Containerized plants would be hardened off prior to planting or planted during the dormant period. Cuttings should be collected from dormant plants and planted during the dormant period.

- Use salvaged plant materials where feasible, primarily in riparian, marsh, and desert habitats. Smaller plant specimens located within the right-of-way may be appropriate for salvage if timing is appropriate and they can be quickly replanted following construction. Cuttings can be obtained from the ripe wood of the past season's growth (old wood) and should be collected prior to spring leaf out to reduce water loss through transpiration. Cuttings would be planted in a dormant state. Salvaged plant materials also provide a ready source of seed, either for collection and reseeding, or by placement of the plant debris within the restored right-of-way following final grading.

2.3.1 Seeding

Seeding will be used as the primary revegetation program along the right-of-way within the naturally occurring communities. Seed will be obtained from commercial sources. Seeding will occur after topsoil replacement, recontouring of the right-of-way, and installation of erosion control measures. Representative seed mixes are listed for each habitat type in Section 2.4.

Suggested seed mixes are provided for each habitat type in the following sections. These recommended mixes were developed from an analysis of existing dominant and successional stage plant species within the habitat types. They may be modified or substituted with alternative appropriate species by the revegetation specialists during the revegetation efforts if the seeds are not readily available at the time of application. Seed mixes will be reviewed and approved by landowners and land management agencies, and will be modified as needed. FERC and SLC approval is required prior to the implementation of any change to this revegetation plan. Estimated seeding rates are based on achieving the following number of seeds per square foot (Vallentine, 1971):

- Large seeds (< 100,000/lb.) - 10-20/sq.ft.

- Medium seeds (100,000-1,000,000/lb.) - 20-30/sq.ft.

- Small seeds (> 1,000,000/lb.) - 30-40/sq.ft.

The proposed seeding rates may be increased by 50-100 percent if they are hand broadcast rather than drill seeded or hydromulched.

In accordance with FERC guidelines seed and seeding techniques will follow the U.S. Department of Agriculture Soil Conservation Service specifications. These specifications include:

- Seed shall be of a quality which has a minimum pure live seed content of 80 percent (% purity X % germination) and weed seed shall not exceed 0.5 percent of the aggregate of pure live seed and other material.

- Areas to be treated shall be dressed to a reasonably smooth, firm surface.

- On sites where equipment can operate, the seedbed shall be adequately loosened (4- to 6-inches deep) and smoothed. Discing or cultipacking or both may be necessary as determined by the Engineer (or revegetation specialist).

- No implement shall be used that will create an excessive amount of downward movement of soil or clods on sloping areas.

- Seeding may be performed by one of two methods:

  Method 1: Seed shall be evenly broadcast by hand, mechanical hand seeder, power-operated seeder, hydroseeder, or other approved equipment. Seed shall have a soil cover of not more than one inch.

  Method 2: The seed, fertilizer (if used), and wood fiber shall be mixed and uniformly applied hydraulically in the form of a water slurry by hydroseeder. The hydroseeder shall be equipped with a built-in continuous agitation system of sufficient operating capacity to produce a homogenous slurry and a discharge system which will apply the slurry to the slopes at a continuous and uniform rate.

  Seed shall not remain in the slurry for longer than 30 minutes. The slurry shall be applied at a rate that is non-erosive and minimizes runoff.

2.3.2 Imprinting

A revegetation technique known as "imprinting" will be used in the Mojave scrub habitats and in conjunction with seeding in the chenopod scrub habitats, and may also be used in other habitat types at the recommendation of the revegetation specialist. Imprinting is a shaped roller that forms funnel-shaped seedbed and seedling cradles which concentrate water and improve infiltration (Dixon, 1988, 1989). The imprinter provides mulching of above ground plant material without topsoil inversion, and the surface roughness reduces wind speed, facilitating the deposition of sand and the capturing of blowing seeds. The absence of continuous furrows, produced by more conventional planting implements, helps to increase infiltration and further reduce runoff and erosion on steep slopes.

The imprinter can also be used to mulch leftover plant debris, which assists the revegetation effort by protecting seedlings from wind and grazing, encouraging natural regeneration by replanting propagules, and trapping blowing seeds from adjacent vegetation.

If imprinting is to be used in conjunction with seeding in any other habitats, then the seed can be disseminated directly onto the roller, so that seeding occurs simultaneously with imprinting, and the seed mix is imbedded in the surface of the imprint.

2.3.3 Mulching

Mulch will be applied to all disturbed areas, including topsoil salvage, seeded, and imprinted/seeded areas. Seeded and topsoil salvage areas may be mulched with up to 2.0 tons per acre of native or naturalized hay or straw. Imprinted areas will be mulched with 0.5 to 1.0 ton per acre of native or naturalized hay or straw, since imprinting performs many of the same functions as mulching. No mulching would take place in the Mojave Desert. However, areas of the Mojave Desert that have a high potential for wind or water erosion may require stabilization by use of a tackifier. The feasibility of usage would be evaluated by the environmental inspector at the time of restoration. Mulching will follow the specifications stated in FERC's Plan. Mulch will be spread uniformly over the revegetation area so that at least 75 percent of the ground surface is covered. If a mulch blower is used, the strands should not be shredded less than 8 inches in length to allow anchoring. Mulch will be anchored immediately, using a mulch anchoring tool or imprinter. For imprinted areas, mulch will be spread concurrently with the seeding and imprinting in one uniform process. Erosion control fabrics may be used in addition to, or as an alternative to, mulching on slopes exceeding 30%.

2.3.4 Fertilizer

Fertilizer is generally not deemed necessary in revegetation programs, since the topsoil will be salvaged and the use of fertilizer may produce overly dense stands of annual grasses, thus preventing the successful establishment of native shrubs. Fertilizer may be considered for specific problem areas as identified by the revegetation specialist.

2.3.5 Container Planting and Transplanting

Container plants, cuttings, and transplanted salvaged plant materials may be used in limited areas in Mojave scrub, foothill woodlands, and riparian habitats. The use of this live plant material will provide for immediate cover within high quality riparian and foothill woodland communities, will minimize visual impacts, and will conserve sensitive plant species. The specific plant specimens and locations for planting will be developed at a site specific level by the revegetation specialist.

Container plants will be purchased from a commercial supplier experienced in growing native plant materials. Containerized plants will be hardened off prior to planting and/or planted during the dormant state. Transplanting existing plants can be very effective for certain plant species, including many of the herbaceous freshwater and brackish marsh species, several herbaceous riparian woodland species, and the cactus and yucca species. In addition, cuttings may be taken from cottonwood and willow species in the riparian woodland habitats. Where necessary and approved, these appropriate species will be removed from the construction zone immediately prior to the initiation of construction (one week or less) under the supervision of the revegetation specialist. They will be held in a semi-shady location and kept moist until construction and revegetation procedures are completed, and then replanted in the right-of-way near the location from which they were removed. Transplanted materials and containerized plants will be deep-watered at the time of planting, and will be monitored and deep watered at least every month for six months following planting.

2.4 HABITAT TYPES

2.4.1 Mojave Desert Scrub Community

Topsoil salvage and replacement and imprinting are the revegetation techniques proposed for the Mojave scrub habitats. Topsoil and/or other surface material (such as desert pavement) removed during construction in Mojave scrub habitats will be temporarily stored onsite and replaced in the right-of-way in the original sequence immediately after installation of the pipe. The habitats will be regraded to their original contours following construction, and imprinted with an imprinting device. No seeding or mulching is proposed within the Mojave scrub habitats.

Certain high-interest desert species, including Joshua trees, yuccas, and cactus (other than *Opuntia* species) occurring within the right-of-way that cannot be avoided will be salvaged during construction activities and replanted as soon as possible. These plants will be removed from the right-of-way, held in a cool, dry place during construction, and replanted near their original location immediately after right-of-way recontouring and topsoil replacement. They will be replanted in their original orientation (north side facing north). Only smaller Joshua trees, of a size where transplanting is likely to be successful, will be transplanted. Larger ones will be removed from the right-of-way during construction and will be placed intact in the right-of-way to provide cover for the establishment of other species.

2.4.2 Nonnative Grassland

Approximately 800 acres of non-native grassland habitat will be disturbed within the construction right-of-way. Although these non-native grassland habitats likely would naturally revegetate following construction, direct seeding following construction restoration will facilitate the site revegetation, reduce soil erosion, and potentially reintroduce some native species which are currently in low abundance in the area. Because of the variability of species composition in the nonnative grasslands found along the proposed route, specific seed mixes should be formulated that are representative of the conditions adjacent to the disturbed right-of-way. For example, wild oats (*Avena sp.)* should only be included as part of the seed mix in the Coast Range Nonnative grasslands. Table 2-2 identifies several species of non-native grasses that should form the predominance of the seed mix. Additionally, several native forbs are presented that can be intermixed with the seed mix to increase local populations. Particular native forbs should only be introduced into the seed mix if the species in found in the vicinity of the pipeline. All seeds should be collected at or near the restoration location.

Seeding will not be used within 50 feet of any vernal pool habitats associated with the grassland areas. In the vicinity of vernal pools, the existing soil seedbank within the nonnative grassland will be salvaged and replaced over the right-of-way following installation.

2.4.3 Chenopod Scrub

Approximately 52 acres of chenopod scrub habitat will be disturbed within the construction right-of-way. The revegetation plan for the disturbed chenopod scrub habitats includes topsoil replacement, imprinting, and seeding. Seed will be obtained commercially, and the supplier will be required to use seed collected locally (within a 50-mile radius of the site). Seeding will occur after recontouring and prior to imprinting. All areas of disturbance will be seeded and then mulched with 0.5-1.0 ton per acre of native or naturalized hay or straw. The mulch will be broadcast over the

Table 2-2

NONNATIVE GRASSLAND REVEGETATION LIST

Scientific Name	Common Name	Seeding Rate (lbs PLS/acre)	Comments
Nonnative Grasses[a]			
Bromus hordeaceus (Bromus mollis)	Soft chess	5.0	
Vulpia myuros (Festuca megalura)	Zorro fescue	3.0	
Avena spp.[d]	Wild oats	3.0	
Native Forbs[b, c]			
Lupinus nanus, L. bicolor	Lupine	0.5	
Eschscholtzia californica	California poppy	1.0	
Phacelia spp.	Phacelia	0.5	

Note: This list should not be substituted for site-specific formulation of seed mix during preconstruction and restoration phases.

[a] Revegetation seed mix should be developed using species that are local to the restoration area. Seed mix may vary widely between Central Valley and Coast Ranges.

[b] Native forbs should be included in seed mix only if individual species is present on or adjacent to the pipeline right-of-way.

[c] Seeds should be locally adapted genotypes.

[d] Wildoats would only be included for seed mixes in the Coast Range physiographic province.

PLS = Pure live seed.

revegetation area, and then crimped in using the imprinter. The recommended seed mix for chenopod scrub habitats is shown in Table 2-3.

2.4.4 Foothill Woodland

About 38 acres of foothill woodland habitat will be disturbed within the construction right-of-way. The understory component of the foothill woodland areas is very similar to that of the non-native grasslands, and primarily composed of non-native grassland species. Restoration of the nonnative grassland herbaceous layer within these foothill woodlands will be conducted in a similar manner as discussed previously in Section 2.4.2. The seed mix used should reflect the conditions within the adjacent areas. The seed mix contained in Table 2-4 provides a basis for the development of a mix to be used in these areas.

Additionally, the revegetation program for foothill woodland areas will require the supplemental planting of acorns in areas where construction will require the removal of oak tree

Table 2-3

CHENOPOD SCRUB REVEGETATION LIST[a]

Scientific Name	Common Name	Seeding Rate (lbs PLS/acre)	Comments
Shrubs			
Atriplex polycarpa	Valley saltbush	4.0	
Atriplex spinifera	Spiny saltbush	1.0	
Forbs[b]			
Hemizonia pungens	Common spikeweed	0.5	
Platystemon californica	Cream cups	0.5	
Gilia tricolor	Bird's eye	0.5	

[a] All seeds used for revegetation would be collected locally.

[b] Forbes to be included in seed mix only if they presently exist on or adjacent to the right-of-way.

species. Oaks removed by project construction with a diameter-at-breast-height (dbh) of greater than 6 inches will be replaced by oaks of the same species (valley oak, blue oak, interior live oak, or coast live oak) at a replacement ratio of 30:1 for planted acorns. Acorn planting will be performed under the supervision of the revegetation specialist.

When acorns are used, they will be collected from areas adjacent to the area of impact, and will be planted in the fall. Prior to planting, all acorns will be tested through the floatation test to identify viable acorns. Only viable acorns will be planted. Three acorns will be planted in an area of loosened soil about three feet wide and one foot deep. Planting 3 acorns per hole will reduce the likelihood of acorn depredation by animals, and should not create competition between seedlings (Tietje 1991). The acorns should be spaced approximately 4 inches apart, and about 2 inches deep (Tietje 1991). A shallow ditch would be formed around each planting unit to retain water. The area around the planting will be mulched to conserve moisture and reduce competition. Both container plantings and acorn plantings will be deep-watered following planting, and will be irrigated at least once per month for six months following planting.

Protective measures may be required around acorn plantings if animal or insect predation becomes a problem. Dependant upon landowner approval, the entire right-of-way may be fenced to minimize impacts due to grazing and predation. Individual caging is relatively expensive in terms of labor and materials, but protection may be required in planting areas that are heavily grazed by cattle or deer (Bernhardt 1991). Cages constructed of window screen material protect seedlings from predation by insects, and may also modify the seedling microenvironment by providing shade (Adams 1991). The fencing would remain around the developing trees for a minimum of 5 years or until the tree can survive without protection from grazing. The elimination of herbaceous plants around seedlings seems to discourage gopher predation on seedlings (Adams 1991).

Table 2-4

FOOTHILL WOODLAND REVEGETATION LIST

Scientific Name	Common Name	Density/Seeding Rate (Nos./lbs PLS/acre)	Comments
Overstory^{a}			
Quercus lobata	Valley oak	8 - 10 feet on center	Planted as an acorn
Quercus douglasii	Blue oak	8 - 10 feet on center	Planted as an acorn
Quercus wislizenii	Interior live oak	8 - 10 feet on center	Planted as an acorn
Quercus agrifolia	Coastal live oak	8 - 10 feet on center	Planted as an acorn
Herbaceous^{b}			
Vulpia myuros	Zorro fescue	3.0	
Bromus hordeaceus	Soft chess	5.0	
Avena spp.^{c}	Wild oats	3.0	

[a] Overstory oaks would be replaced on a 30:1 ratio. For each oak removed, 10 plantings of 3 acorns each will be required. Revegetation plans would replace lost oaks with similar species. Each planting would be appropriately protected to protect predation or grazing.

[b] Grasses included in the site-specific revegetation should reflect species present on adjacent lands.

[c] Wild oats would only be included for seed mixes in the coast range physiographic province.

2.4.5 Wetlands

Riparian Woodland, Riparian Shrub, and Riparian Marsh Communities

The proposed route crosses about 63 streams containing riparian vegetation (about 48 acres). On the basis of initial field investigations, at least seven distinct riparian communities are traversed by the proposed route. These riparian areas are all distinguishable from each other on the basis of the dominant tree and shrub species within the riparian zone. These communities range from cottonwood-dominated communities to freshwater marshes. Because of the variability of the riparian communities traversed by the proposed route, revegetation will be tailored specifically to represent the preconstruction conditions within the riparian zone. Table 2-5 identifies representative plantings that can be used at riparian crossings. This list should be adapted by the revegetation specialist to develop site-specific revegetation for each riparian zone. Final revegetation specifications are subject to the approval of both the FERC and SLC.

Detailed restoration plans will be developed for each of these crossings during the regulatory permit process with the USACE and the DFG. Prior to submittal of the plans to these agencies, the plans must be approved by the FERC, serving as lead agent on the project. Many of the stream crossing will be bored underneath, and may not be affect by construction activities. Minor stream crossings, and those crossing at which the boring pit is not located entirely outside of the riparian area, will require some degree of restoration. The following guidelines will be incorporated into the individual restoration plans for these riparian areas.

Topsoil removed during construction in riparian areas will be temporarily stored onsite and replaced over the right-of-way immediately after installation of the pipe. The riparian habitats will be regraded to their original contours following construction, and replanted with appropriate vegetation. Revegetation efforts in these habitats will include salvage of on-site material as well as planting of container plants, liners, and/or cuttings.

Containerized plantings and liners will be planted in a hole twice as deep and wide as the container, and backfilled with native soil. The plant will be deep-watered following planting, and a two-inch layer of coarse, organic, weed-free mulch will be placed around the planting to conserve moisture and to reduce competition from grass species. Tree species will not be staked.

Revegetation of the herbaceous marshes will be accomplished primarily through salvage of material collected off the right-of-way prior to construction. About 8 to 12 inches of topsoil and the existing freshwater marsh vegetation will be removed in one operation during construction activities, temporarily stored on or offsite, and replaced immediately after installation of the pipeline. The vegetative material should be stored in a cool dry place or watered periodically to maintain viability. If required, the construction right-of-way will be regraded to their original contours following construction and prior to the replacement of topsoil/salvaged vegetation. Although highly degraded/disturbed riparian wetlands are generally grouped under the classification of a herbaceous marsh, restoration efforts in these areas may also include plantings. This determination can be made on a site-by-site determination by the environmental inspector on-site.

Seasonal Wetlands

Seasonal wetlands encountered along the pipeline will be restored in a similar fashion to the freshwater marsh components of the riparian wetlands. Pre-construction contours will be restored during the pipeline restoration phase. Revegetation will be completed through topsoil segregation and salvage of existing plant material. The necessary requirements are more fully developed in the preceding discussion. The most important component of the seasonal wetland restoration effort would be the restoration of preconstruction contours.

Vernal Pools

Pending completion of detailed route engineering studies, Mojave has agreed to avoid all vernal pools that could be potentially impacted by the proposed project. For this reason, no specific revegetation plans have been developed for the restoration phase of construction. Because vernal pool creation is an experimental procedure and reestablishment success is uncertain, off-site compensatory acreage may be required if avoidance is not feasible. Mojave should file with the FERC and SLC a site-specific vernal pool restoration plan developed in consultation with the USACE, FWS, and DFG that includes:

- Identification of the acreage and habitat value of the vernal pools to be removed.

- Details of the procedure Mojave would use to restore the duripan layer.

- A postconstruction monitoring program with success criteria based on monitoring within adjacent undamaged vernal pools.

- A protocol for identifying offsite compensatory acreage of in-kind habitat at a ratio of 1:1.

Nonnatural Ponding Areas

The nonnatural ponding areas occur primarily where clay soils are present adjacent to existing rights-of-way and winter rains collect in low areas forming pools that may hold water for up to five months. These areas are sparsely vegetated depressions, with the existing vegetation not characteristic of vernal pool communities. However, many of these areas have been identified as serving an important role to several invertebrate species of concern. For this reason, it would be required that any nonnatural ponding areas identified during preconstruction surveys to support invertebrate species of concern, and which would be disturbed during construction activities, would be restored to preconstruction conditions following construction. It would be necessary that concurrence is reached with FERC and SLC, concerning preconstruction survey methodologies and results, to establish the number and location of all nonnatural ponding areas within the right-of-way that need to be restored.

Alkali Lowlands

Approximately 54 acres of alkali lowland habitat will be disturbed within the construction right-of-way. Due to the unique nature of this habitat, the revegetation program for alkali lowland habitats will include only the salvage and replacement of topsoil. Approximately 8-12 inches of surface material will be excavated, stockpiled, and replaced following installation of the pipeline. The ground surface will be regraded to the contours existing prior to the disturbance in order to maintain surface hydrology.

Coastal Brackish and Salt Marsh

Approximately 25 acres of brackish and salt marsh will be disturbed within the construction right-of-way. Revegetation efforts in these marsh habitats will include topsoil segregation and vegetation salvage. The width of the right-of-way will be limited to 75 feet or less (FERC, 1992). The top 12 inches of topsoil and the existing vegetation will be removed from the trench in one operation during construction activities, temporarily stored onsite, and replaced immediately in its original position over the backfilled trench after installation of the pipeline. If required, the marsh habitats will be regraded to their original contours following construction and prior to the replacement of topsoil/salvaged vegetation.

Brackish and salt marsh species may be salvaged and transplanted individually or in large clumps. The plants will be removed from the right-of-way during construction, temporarily stored in a cool, moist place, and replanted in the right-of-way following recontouring.

Recommended species for brackish marsh revegetation are shown in Table 2-5; recommended salt marsh species are shown in Table 2-6.

Table 2-5

RIPARIAN COMMUNITY REVEGETATION LIST[a]

Scientific Name	Common Name	Density/Seeding Rate (No./acre or lb PLS/acre)	Comments
Overstory			
Quercus lobata	Valley oak	[b]	Planted as an acorn
Fraxinus latifolia	Oregon ash	[b]	Containerized plant
Platanus racemosa	Sycamore	[b]	Containerized plant
Populus fremontii	Cottonwood	[b]	Containerized plant/cutting
Shrub			
Rosa californica	California rose	50/acre	Containerized plant
Salix spp.	Willow	200/acre	Cutting
Baccharis salicifolia	Mulefat	2.0 lbs	
Herbaceous			
Leymus triticoides *(Elymus triticoides)*	Wild rye	4.0 lbs	
Artemisia douglasiana	Mugwort	2.0 lbs	
Carex spp.	Sedges		Salvage
Juncus balticus	Rush		Salvage
Juncus effusus	Soft rush		Salvage
Typha latifolia	Cattail		Salvage
Scirpus acutus	Tule		Salvage
Cyperus eragrostis	Nutsedge		Salvage

[a] Provided list represents revegetation species for multiple habitats. Site-specific revegetation plans should be developed using species specific to the riparian area.

[b] Replaced on a 3:1 ratio with intent for full replacement. Replacement plants should be of same ratio to species removed from the right-of-way.

Table 2-6

BRACKISH MARSH REVEGETATION LIST

Scientific Name	Common Name	Seeding Rate (lbs PLS/acre)	Comments
Carex spp.	Sedge		Salvage
Juncus balticus	Rush		Salvage
Juncus effusus	Soft rush		Salvage
Scirpus acutus	Tule		Salvage
Typha latifolia	Cattail		Salvage
Salicornia virginica	Pickleweed		Salvage
Distichlis spicata	Saltgrass		Salvage

3.0 IMPLEMENTATION

3.1 IMPLEMENTATION PROCESS

The revegetation program for the Northward Expansion will be an integral part of the construction process, and will be the last step in construction. Revegetation procedures and requirements will be identified in the construction contract and construction documents. Prior to the release of contract documents, all site-specific revegetation plan specifications will be approved by FERC and SLC. Mojave will maintain quality control over the process by use of a monitoring team, including clean-up inspector, environmental monitors, and revegetation specialists.

3.2 SUPERVISION AND INSPECTION

FERC guidelines require that the revegetation program be conducted in accordance with the appropriate portions of their Plan and Procedures. These guidelines require that least one Environmental Inspector for each construction spread used during construction. Environmental Inspector(s) shall have direct responsibility to enforce requirements of this plan, and shall have peer status with all other activity inspectors. Problems with contractor compliance shall be reported to the Environmental Inspector(s) for remedial action, and Environmental Inspector(s) shall have the authority to order correction of acts that violate the environmental conditions of the FERC Certificate.

The duties of the Environmental Inspector(s) applicable to the revegetation program include monitoring and supervising the following:

- Compliance with the requirements of FERC's Plan and Procedures, environmental conditions of the FERC Certificate, and other environmental permits and approval;
- Identification of stabilization needs in all areas;
- Restoration of the soil profile as required;
- Documentation of the implementation of the temporary and permanent erosion control and revegetation programs during construction; and
- Setting up a program for monitoring success of the revegetation measures for not less than 2 years for herbaceous upland vegetation, 3 years for wetland and riparian vegetation, and 5 years for oak woodlands to determine the success of the restoration and the need for additional restoration where restoration is unsuccessful, and preparation of activity reports not less than quarterly during this period documenting problems identified by company personnel and/or landowners, and solutions identified and implemented. This monitoring program will be transferred to Mojave upon completion of construction and restoration activities.

A revegetation specialist(s) will be employed for the project. The responsibilities of the specialist(s) include:

- Responsibility for ensuring that the revegetation program is correctly developed and implemented.

- Identifying and implementing adjustments in procedures, if necessary, based on special site characteristics or other factors.

- Providing technical expertise in location of water bars and other erosion control devices.

- Providing on-site technical expertise in specialized tasks, such as transplanting plants.

- Providing liaison with agency personnel as necessary concerning the revegetation process.

- Coordinating with the environmental monitoring team to ensure accurate reporting of revegetation implementation.

A post-construction inspection of the project area will be conducted by the environmental monitoring team. This inspection will determine the actual extent of ground disturbance and the specific locations where the revegetation procedures were applied. Following FERC guidelines, a summary report will be prepared within 30 days of the in-service date for the facility and filed with the Commission. This report will include the following:

- quantity and type of seed, fertilizer, and mulch used for each pipeline segment;

- the amount of lime applied (if required);

- the equipment used to implement the plan;

- the acreage treated;

- the dates of backfilling and treating; and

- the number of landowners specifying other seeding requirements and a description of the requirements.

4.0 MAINTENANCE AND MONITORING

Followup inspections of the revegetated areas will be conducted for a period of not less than 2 years for herbaceous upland vegetation, 3 years for wetland and riparian vegetation, and 5 years for oak woodlands with each survey following the growing season to determine the success of the revegetation effort. The monitoring period will need to be extended in areas restored by planting acorns, cuttings, or containerized plants. Revegetation will be considered successful if the nonnuisance vegetation is similar in density to adjacent undisturbed lands, based on representative visual surveys and random sampling in the field. If the vegetation cover is considered unsuccessful or if there is a need for noxious weed control measures, the revegetation specialist will be consulted to determine the need for additional restoration measures (such as reseeding) based on site conditions.

Efforts to control off-road vehicle use, in cooperation with the landowner, will continue throughout the life of the project. Signs, gates, and vehicle trails should be maintained as necessary.

Monitoring of the construction right-of-way will be performed for not less than 2 years for herbaceous upland vegetation, 3 years for wetland and riparian vegetation, and 5 years for oak woodlands following implementation of the revegetation program in accordance with FERC guidelines. Monitoring will include periodic aerial or ground surveys to monitor the success of the planting, erosion, and vehicle traffic. Travel by maintenance crews would be restricted to existing access roads. Annual monitoring reports will be prepared and distributed to the appropriate agency personnel. During the first year, the right-of-way will be monitored quarterly. Written reports will be submitted following each monitoring effort. The presence of serious hydrologic or vegetative problems will be identified after each evaluation, and remedial actions will be proposed as necessary. At the end of the monitoring period, a final inspection of the project area will be conducted. Qualitative evaluations of the construction right-of-way will be made to determine the success of the revegetation program. Quantitative measurements of shrub density will be estimated at random locations along the right-of-way and compared to adjacent undisturbed areas.

Per FERC guidelines:

- Revegetation of upland areas shall be considered successful if non-nuisance vegetation is similar in density to adjacent undisturbed lands, based on random sampling in the field (e.g., visual survey). If vegetative cover is considered unsuccessful or if there is a need for noxious weed control measures, the judgement of a professional agronomist shall be used to determine the need for additional restoration measures (such as fertilizing or reseeding) based on site conditions, and those actions shall be undertaken as recommended by this agronomist.
- Revegetation of wetland habitats (riparian woodland, freshwater marsh, brackish marsh, and vernal pool) is considered successful if the native herbaceous and/or woody cover is at least 80 percent of the total cover, and native species diversity is at least 50 percent of the diversity, originally found in the wetland. If revegetation is not successful at the end of 3 years, the project sponsor shall develop and implement (in consultation with a professional wetland ecologist) a plan to actively revegetate the wetland with native wetland herbaceous and woody plant species.

5.0 REFERENCES

Adams, Theodore E., Jr., and P.B. Sands, W.H. Weitkamp, and N.K. McDougald. Blue and Valley Oak Seedling Establishment on California's Hardwood Rangelands. Pages 41-47 in: Proceedings of the Symposium on Oak Woodlands and Hardwood Rangeland Management; October 31-November 2, 1990; Davis, CA. Richard B. Standiford. USDA Gen. Tech. Report PSW-126.

Bauder, Ellen T. and Anne Larigauderie. September 1991. Rehabilitation Success and Potential of Mojave and Colorado Desert Sites. California Department of Parks and Recreation, Off-Highway Motor Vehicle Recreation Division.

Bernhardt, Elizabeth A., and Tedmund J. Swiecki. 1991. Minimum Input Techniques for Valley Oak Restocking. Pages 2-8 in: Proceedings of the Symposium on Oak Woodlands and Hardwood Rangeland Management; October 31-November 2, 1990; Davis, CA. Richard B. Standiford. USDA Gen. Tech. Report PSW-126.

Dixon, R. M. 1990. Land Imprinting for Dryland Revegetation and Restoration. Pages 15-22 in: Environmental Restoration, Science and Strategies for Restoring the Earth. John J. Berger. Island Press.

Federal Energy Regulatory Commission. 1992. Erosion Control, Revegetation, and Maintenance Plan.

Garcia, Tim. Soil Conservationist. Soil Conservation Service. Concord, CA. Personal communication. May, 1994.

Guinon, Marylee, and David Allen. Restoration of Dune Habitat at Spanish Bay. Pages 70-80 in: Environmental Restoration, Science and Strategies for Restoring the Earth. John J. Berger. Island Press.

Hickman, J., ed. The Jepson Manual, Higher Plants of California. 1993. University of California Press.

Holland, R. 1986. Preliminary Descriptions of the Terrestrial Natural Communities of California. State of California, Department of Fish and Game Report.

Kay, Burgess L. September 1988. Artificial and Natural Revegetation of the Second Los Angeles Aqueduct. Mojave Revegetation Notes, No. 24.

Kay, Burgess L. and Walter L. Graves. 1983a. Revegetation and Stabilization Techniques for Disturbed Desert Vegetation. Pages 325-339 in: Environmental Effects of Off-Road Vehicles, Impacts and Management in Arid Regions. R.H. Webb and H.G. Wilshire. Springer-Verlag.

Kay, Burgess L. and Walter L. Graves. 1983b. History of Revegetation Studies in the California Deserts. Pages 315-324 in: Environmental Effects of Off-Road Vehicles, Impacts and Management in Arid Regions. R.H. Webb and H.G. Wilshire. Springer-Verlag.

Klco, Kenneth S., Restoration Symbiosis: Integrating Environmental Programs into Industrial Operations for Quarry Reclamation Success at Coaldale, Colorado. Pages 137-141 in: Environmental Restoration, Science and Strategies for Restoring the Earth. John J. Berger. Island Press.

Racin, James A. and Tom Dayak. 1986. Revegetation of Highway Slopes in the High Desert with Native Plant Seedlings. California Department of Transportation.

Rafter, Rickson. Soil Conservationist. Soil Conservation Service. San Mateo County. Personal Communication. May, 1994.

Romney, E., A. Wallace, and R. Hunter. 1989. Transplanting of Native Shrubs on Disturbed Land in the Mojave Desert. In Proceedings: Symposium on Shrub Ecophysiology and Biotechnology. USFS General Technical Report INT-256.

Simpson, David. Soil Conservationist. Soil Conservation Service. Stockton, CA. Personal communication. May, 1994.

Soil Conservation Service. December 1983. Planting Techniques and Materials for Revegetation of California Roadsides. Research Report No. FHWA/USDA LPMC-2.

Soil Conservation Service. 1986. Stockton Field Office Technical Guide and Revegetation Specifications. U.S. Department of Agriculture.

Tietje, William D., S.L. Nives, J.A. Honig, and W.H. Weitkamp. 1991. Effect of Acorn Planting Depth on Depredation, Emergence, and Survival of Valley and Blue Oak. Pages 14-19 in: Proceedings of the Symposium on Oak Woodlands and Hardwood Rangeland Management; October 31-November 2, 1990; Davis, CA. Richard B. Standiford. USDA Gen. Tech. Report PSW-126.

Vallentine, J.F. 1971. Range Developments and Improvements. Brigham Young University Press.

Woodward-Clyde Consultants, Inc. (WCC). 1990. Mojave Pipeline Project Mitigation Plan Volume 2: Reclamation Plan.

Woodward-Clyde Consultants, Inc. (WCC). July 1994. Revised Biological Resources Survey Report - Mojave Northward Expansion Project.

APPENDIX C

WETLAND AND WATERBODY CONSTRUCTION AND MITIGATION PROCEDURES 1/

These Wetland and Waterbody Construction and Mitigation Procedures (Procedures) require proposed pipeline projects to be routed in a manner that minimizes the crossing and disturbance of wetland and waterbody ecosystems to the maximum extent practicable. If a project sponsor considers a specific part of these procedures to be technically infeasible due to site-specific engineering constraints, the project sponsor must identify the alternative provision(s) that it would implement, on a site-specific basis, that would provide an equal or greater level of protection to wetland and waterbody ecosystems.

- Alternative provisions to these Procedures are not permitted except as a result of Commission certificate or Director of the Office of Pipeline Regulation (OPR) clearance letter.
- Site-specific construction plans, prepared pursuant to Sections I.H and II.C.13 of these Procedures, if applicable, and a Spill Prevention, Containment, and Control (SPCC) Plan prepared pursuant to Section I.A.5, must be provided for approval by the Director of OPR prior to project construction.

The procedures in Sections I through III of these Procedures require that judgment be applied in the field and must be implemented under the supervision of the project sponsor's Environmental Inspector(s) or other qualified professional(s) with knowledge of wetland and waterbody conditions in the project area. Non-compliance with these procedures must be reported to the Environmental Inspector(s) for remedial action.

I. WATERBODY CROSSINGS

A. STAGING AND OTHER ANCILLARY AREAS

1. Access roads across a waterbody must use a construction equipment bridge as specified in Sections I.F.1 and I.G.1 of these Procedures.
2. Locate all staging areas, additional spoil storage areas, and other additional work areas at least 50 feet away from water's edge, if topographic conditions permit. If topographic conditions do not permit a 50-foot setback, then these

---

1/ As used in these Procedures the term wetland is defined as any area that satisfies the requirements contained in the current Federal methodology for identifying and delineating wetlands. The term waterbody as used in these Procedures is defined as any stream or river with perceptible flow at the time of crossing and other permanent waterbodies, such as ponds and lakes.

areas must be located at least 10 feet away from the water's edge. In no event shall vegetation be cleared between these areas and the waterbody.

3. Limit size to minimum needed to construct the waterbody crossing.

4. Do not store hazardous materials, chemicals, fuels, lubricating oils, or perform concrete coating activities, within 100 feet of waterbodies or within any municipal watershed area (except at locations within areas that are designated for these purposes by an appropriate governmental authority).

5. Refuel all construction equipment at least 100 feet from waterbodies. Where conditions require that construction equipment (e.g., barge-mounted backhoes, trench dewatering pumps) be refueled within 100 feet of waterbodies, specifically address these activities in a project-specific SPCC Plan which:

    a. identifies typical fuel, lubricants, and hazardous materials used or stored in the project area, and the amount and mode of storage in the area;
    b. describes the preventive and mitigative measures to avoid or minimize impacts of spills of fuel, lubricants, or hazardous materials, especially within any municipal watershed area or within 100 feet of any waterbody or wetland;
    c. requires all fueling and lubricating to be done in areas designated for such purposes (with such areas to be located away from all wetlands and waterbodies);
    d. requires each construction crew to have sufficient supplies of absorbent and barrier materials on-hand to allow the rapid containment and recovery of any spills;
    e. includes procedures for collection and disposal of waste generated during vehicle maintenance; and
    f. includes procedures regarding excavation and disposal out of wetlands or waterbodies of any soil materials contaminated by spillage.

B. SPOIL PILE PLACEMENT AND CONTROL

1. All spoil from minor and intermediate waterbody crossings, and upland spoil from major waterbody crossings must be placed in the right-of-way at least 10 feet away from water's edge, or in additional spoil storage areas located as required in I.A.2. 2/ At a minimum, all spoil shall be contained within sediment filter devices.

2. Prevent flow of spoil off of right-of-way or into waterbody.

2/ As used in these Procedures the term minor waterbody applies to waterbodies less than 10 feet wide, the term intermediate waterbody applies to waterbodies greater than 10 feet wide but not greater than 100 feet wide, and the term major waterbody applies to waterbodies greater than 100 feet wide.

C. TIME WINDOW FOR CONSTRUCTION.

1. Unless expressly permitted or further restricted by the appropriate state agency in writing on a site-specific basis, crossings must be constructed during the following time windows:

    a. Coldwater Fisheries - June 1 through September 30; and
    b. Warmwater Fisheries - June 1 through November 30.

2. Notify authorities responsible for potable surface water supply intakes located within 3 miles downstream of the crossing at least 1 week prior to commencement of work in the waterbody.

D. GENERAL CROSSING PROCEDURES

1. Provide written notification to the U.S. Army Corps of Engineers (COE) of the proposed construction activities.

2. Comply with section 404 nationwide permit program conditions (33 CFR Part 330) at a minimum.

3. Apply for state-issued waterbody crossing permits and obtain individual or generic section 401 water quality certification or waiver.

4. Construct crossings as close to perpendicular to the axis of the waterbody channel as engineering and routing conditions permit.

5. Use clean gravel for upper 1 foot of trench backfill in all minor and intermediate waterbodies that contain coldwater fisheries.

6. Adequate flow rates must be maintained to protect aquatic life, provide for all waterbody uses, and provide for downstream withdrawals of water by existing users.

7. If clearing equipment must cross waterbodies prior to installation of equipment bridges, crossings shall be limited to one crossing of the stream per piece of equipment.

E. EQUIPMENT BRIDGES.

1. All equipment bridges shall be designed to withstand the maximum flow and maintained to prevent flow restriction during the period the equipment bridge is in place.

2. Remove all flumes, dams and equipment bridges after final cleanup and grading but prior to completion of initial permanent seeding.

3. Where appropriate alternative access is available to the applicable parts of the right-of-way, equipment bridges shall be removed if there will be more than 1 month between final cleanup and grading and the beginning of initial permanent seeding.

4. Consistent with the availability of reasonable alternative access, bridges across waterbodies containing coldwater and significant warmwater fisheries shall be removed at the earliest time possible to minimize impact on fish spawning.

F. CROSSINGS OF MINOR WATERBODIES (10 FEET WIDE OR LESS)

1. For crossings of all coldwater and warmwater fisheries, construction equipment (except that used by clearing crews) must cross the waterbody on an equipment bridge consisting of one of the following:

   a. Equipment pads and culvert(s);
   b. Clean rockfill and culvert(s);
   c. Flexi-float or portable bridge.

2. For crossings of all coldwater fisheries, and warmwater fisheries considered significant by the state fish management agency, route waterbody flow across trench using flume pipe, and install pipeline using all of the "dry-ditch" techniques as follows:

   a. Install flume after blasting, but prior to trenching;
   b. Use sand bag or plastic dam structure;
   c. Properly align flume pipe;
   d. Do not remove flume during trenching, pipe-laying, or backfilling activities;

3. For minor waterbody crossings not covered by Section I.F.2 of these Procedures, complete construction in the waterbody (not including blasting) within 24 hours.

G. CROSSINGS OF INTERMEDIATE WATERBODIES (GREATER THAN 10 FEET WIDE, BUT NOT GREATER THAN 100 FEET WIDE)

1. Construction equipment (except that used by clearing crews) must cross on bridge consisting of one of the following:

   a. Equipment pads and culvert(s);
   b. Clean rockfill and culvert(s);
   c. Flexi-float or portable bridge.

2. Limit use of equipment operating in the waterbody to that needed to construct the crossing.

3. Notify state authorities that request such notification at least 48 hours prior to commencement of trenching or blasting within the waterbody.

4. Attempt to complete trenching and backfill work within the waterbody (not including blasting) within 48 hours, unless site-specific physical conditions make completion within 48 hours impractical.

H. CROSSINGS OF MAJOR WATERBODIES (MORE THAN 100 FEET WIDE)

All major water body crossings must be constructed in accordance with the measures contained in these Procedures to the maximum extent practicable. Unless the pipeline is installed by directional drilling, horizontal boring or jacking, or is installed on an existing bridge or aerial crossing structure, develop and submit detailed, site-specific construction procedures (including scaled drawings identifying all areas to be disturbed by construction) for each major waterbody crossing. This requirement does not apply to offshore pipeline construction.

I. TEMPORARY EROSION AND SEDIMENT CONTROL

1. Install and maintain in proper working order temporary sediment filter devices adjacent to all waterbodies.

2. Use trench plugs at all non-flumed waterbody crossings to prevent diversion of water into upland portions of the pipeline trench during construction.

J. TRENCH DEWATERING

Dewater trench in such a manner that no heavily silt-laden water flows into any waterbody.

K. BANK STABILIZATION AND REVEGETATION

1. All riprap activities must comply with section 404 nationwide permit program conditions (33 CFR Part 330) at a minimum.

2. Limit use of riprap to areas where flow conditions preclude effective vegetative stabilization, unless otherwise specified by state permit.

3. Revegetate disturbed riparian areas with conservation grasses and legumes.

4. Remove all temporary sediment filter devices after upland revegetation efforts are successful.

5. Install permanent slope breakers and trench breakers at base of all slopes adjacent to waterbodies.

L. MAINTENANCE

1. Allow a riparian strip at least 15 feet wide, but preferably 25 feet wide, as measured from the waterbody's mean high water mark to permanently revegetate with native woody plant species across the entire right-of-way. However, to facilitate periodic pipeline corrosion/leak surveys, a corridor centered on the pipeline up to 10 feet wide may be maintained in a herbaceous state. In addition, trees that are located within 15 feet of the pipeline and are greater than 15 feet in height may be selectively cut and removed from the right-of-way

2. Do not use herbicides or pesticides in or within 100 feet of a waterbody.

II. FEDERALLY DELINEATED WETLAND CROSSINGS

These Procedures shall be used when crossing any wetland which satisfies the requirements contained in the current Federal methodology for identifying and delineating jurisdictional wetlands. The project sponsor must delineate all wetlands using the current Federal methodology prior to construction, and must provide the Commission staff with a wetland delineation report upon request, which identifies all federally delineated wetlands by milepost.

A. STAGING AND OTHER ANCILLARY AREAS

1. The only access roads other than the construction right-of-way which can be used in wetlands are those existing roads that can be used with no modification and no impact on the wetland.

2. Locate all staging areas, additional spoil storage areas, and other additional work areas in an upland area at least 50 feet away from wetland boundaries, where topographic conditions permit. If topographic conditions do not permit a 50-foot setback, then these areas must be located at least 10 feet away from the wetland. In no event shall vegetation be cleared between these areas and the wetland.

3. Limit size to minimum needed to construct the wetland crossing.

4. Do not store hazardous materials, chemicals, fuels, lubricating oils, or perform concrete coating activities in a wetland, or within 100 feet of any wetland boundary.

5. Attempt to refuel all construction equipment in an upland area at least 100 feet from a wetland boundary. Where conditions require that construction equipment (e.g., pontoon-mounted backhoes, trench dewatering pumps) be refueled in a wetland or within 100 feet of any wetland boundary, address these activities in a project-specific SPCC Plan prepared under Section I.A.5 of these Procedures.

6. Do not locate aboveground facilities in any federally delineated wetland, except where the location of such facilities outside of wetlands would prohibit compliance with U.S. Department of Transportation regulations.

B. SPOIL PILE PLACEMENT AND CONTROL

Use sediment filter devices as necessary to prevent flow of spoil off of the right-of-way.

C. CROSSING PROCEDURES

1. Provide written notification to the COE concerning the proposed construction activities.

2. Comply with section 404 nationwide permit program conditions (33 CFR Part 330) at a minimum.

3. Apply for state-issued wetland crossing permit(s) and obtain individual or generic section 401 water quality certification or waiver.

4. Route the pipeline to avoid wetland areas to the maximum extent practicable. If a wetland cannot be avoided or crossed by following an existing right-of-way, route the new pipeline in a manner that minimizes disturbance to wetlands. Where looping an existing pipeline, overlap the existing pipeline right-of-way with the new construction right-of-way. In addition, locate the loop line no more than 25 feet away from the existing pipeline unless site-specific constraints would adversely affect the stability of the existing pipeline.

5. Minimize the duration of construction-related disturbance within wetland to the maximum extent practicable.

6. Limit the width of the construction right-of-way to 75 feet or less. Where looping an existing pipeline, the construction right-of-way width shall be measured from the closest existing pipeline being looped.

7. Cut vegetation off at ground level, leaving existing root systems intact, and remove it from the wetland for disposal.

8. Limit pulling of tree stumps and grading activities to directly over the trenchline. Do not grade or remove stumps or root systems from the rest of the right-of-way in wetlands unless the Chief Inspector and Environmental Inspector determine that safety-related construction constraints require removal of tree stumps from under the workpad. In the event that tree stumps must be removed from areas other than the trenchline, the project sponsor must specifically identify the areas where the pulling of tree stumps was required, and must develop and implement a detailed plan to actively reestablish native woody vegetation in these areas. This plan must be submitted to the Commission within 90 days of the completion of construction in the wetland.

9. Segregate the top 1 foot of topsoil from the area disturbed by trenching, except in areas where standing water or saturated soils are present, and then return it to its original position over the backfilled trench.

10. Construction equipment operating in wetland areas shall be limited to that needed to dig trench, install pipe, backfill trench, and restore right-of-way. All other construction equipment shall use access roads located in upland areas to the maximum extent practicable. Where use of access roads in upland areas cannot provide appropriate access, all other construction equipment may pass through the wetland once, using the right-of-way.

11. Do not use dirt, rockfill, tree stumps, or brush riprap to stabilize the right-of-way.

12. If standing water or saturated soils are present, use low-ground-weight construction equipment, or operate normal equipment off of timber riprap, prefabricated equipment mats, or geotextile fabric overlain with gravel fill. Geotextile fabric used for this purpose must be durable and strong enough to allow removal of all gravel fill and fabric from the wetland.

13. Do not cut trees located outside of the construction right-of-way within a wetland to obtain timber for riprap or equipment mats, and attempt to use no more than two layers of timber riprap to stabilize the right-of-way. In the event that more than two layers of timber riprap must be used due to site-specific construction constraints, the following information must be provided as specified at the beginning of these Procedures.

    a. Specific procedures and criteria describing how the project sponsor will determine the locations where more than two layers of timber riprap are required. This information shall include an estimate of the number of locations where more than 2 layers of timber riprap will be required, and shall explain why alternative construction methods that do not involve the use of timber riprap (e.g., prefabricated equipment pads, low-ground-weight equipment, winter construction) cannot be used in these areas;
    b. A detailed plan which addresses the procedures to be used to remove all timber riprap, specific measures (including the import of additional fill material) to restore preconstruction surface contours, and specific measures (including the planting of herbaceous and shrub species) to ensure successful revegetation of the construction right-of-way with native wetland plant species within 3 years after construction;
    c. An agreement to provide the staff with at least 2 weeks advance notice prior to removing any timber riprap; and
    d. A determination from the COE that the proposal either complies with the section 404 nationwide permit program or requires an individual section 404 permit.

14. Remove all timber riprap, prefabricated equipment mats, and geotextile fabric overlain with gravel fill upon completion of construction.

15. Assemble pipeline in upland area and use "push-pull" or "float" techniques to place pipe in trench where water and other site conditions allow.

D. TEMPORARY EROSION AND SEDIMENT CONTROL

Install and maintain temporary sediment filter devices, in proper working order, in the right-of-way near the boundary between wetlands and adjacent disturbed upland areas to avoid sediment flow into the wetland.

E. TRENCH DEWATERING

Dewater trench in such a manner that no heavily silt-laden water flows into any wetland.

F. RESTORATION TECHNIQUES

1. Where the pipeline trench may drain a wetland, construct trench breakers and/or seal the trench bottom as necessary to maintain the original wetland hydrology.

2. Install and maintain in proper working order permanent slope breakers and trench breakers near the boundary between wetlands and adjacent disturbed upland areas to avoid sediment flow into the wetland.

3. Do not use fertilizer or lime, unless required in writing by the appropriate state permitting agency.

4. Restore topsoil to original horizon. Temporarily revegetate disturbed areas with annual ryegrass at a rate of 40 pounds/acre, unless standing water is prevalent or unless permanent planting or seeding with native wetland vegetation is undertaken.

5. Ensure that all disturbed areas permanently revegetate with native wetland herbaceous and/or woody plant species.

6. Develop specific procedures in coordination with the appropriate state agency, where necessary, to prevent the invasion or spread of undesirable exotic vegetation (e.g., purple loosestrife and phragmites).

7. Remove temporary sediment filter devices located at the boundary between wetland and adjacent upland areas after upland revegetation efforts are successful.

G. RIGHT-OF-WAY MAINTENANCE PRACTICES

1. Vegetation maintenance practices over the full width of the permanent right-of-way in wetlands are prohibited. However, to facilitate periodic pipeline corrosion/leak surveys, a corridor centered on the pipeline up to 10 feet wide may be maintained in a herbaceous state. In addition, trees that are located within 15 feet of the pipeline and are greater than 15 feet in height may be selectively cut and removed from the right-of-way.

2. No herbicides or pesticides may be used in or within 100 feet of a wetland.

3. Monitor the success of wetland revegetation annually for the first 3 years after construction. Revegetation is considered successful if the native herbaceous and/or woody cover is at least 80 percent of the total cover, and native species diversity is at least 50 percent of the diversity, originally found in the wetland. If revegetation is not successful at the end of 3 years, the project sponsor shall develop and implement (in consultation with a professional wetland ecologist) a plan to actively revegetate the wetland with native wetland herbaceous and woody plant species.

III. HYDROSTATIC TESTING

A. GENERAL.

1. Perform 100 percent radiographic inspection of all pipeline section welds, or hydrotest the pipeline sections, prior to installation under waterbodies or wetlands.

2. Address the operation and refueling of all hydrostatic test equipment in the SPCC Plan prepared pursuant to Section I.A.5 of these Procedures.

B. INTAKE SOURCE AND RATE

1. Screen the intake hose to prevent entrainment of fish.

2. Do not use state-designated exceptional value waters, waterbodies which provide habitat for federally listed threatened or endangered species, or waterbodies designated as public water supplies, unless appropriate Federal, state and/or local permitting agencies grant written permission.

3. Notify appropriate state agencies of intent to use specific sources at least 48 hours prior to testing activities unless they waive this requirement in writing.

4. Adequate flow rates must be maintained to protect aquatic life, provide for all waterbody uses, and provide for downstream withdrawals of water by existing users.

5. Apply for state-issued withdrawal permit, as required.

6. Hydrostatic test manifolds shall be located outside wetlands and riparian areas to the maximum extent practicable.

C. DISCHARGE LOCATION, METHOD, AND RATE

1. Regulate discharge rate and use energy dissipation device(s) in order to prevent erosion of upland areas, streambottom scour, suspension of sediments, or excessive stream flow.

2. Discharge the test water from existing pipelines, into a filter bag, haybale or silt fence containment structure.

3. Do not discharge into a state-designated exceptional value waters, waterbodies which provide habitat for federally listed threatened or endangered species, or waterbodies designated as public water supplies, unless appropriate Federal, state and/or local permitting agencies grant written permission.

4. Apply for National Pollutant Discharge Elimination System (NPDES) or state-issued discharge permit, as required.

5. Sample the test water during discharge in accordance with any NPDES or state-issued discharge permit requirements. Provide a copy of the results to the Commission's environmental staff upon request.

APPENDIX D

COMPENSATION CALCULATIONS AND BIOLOGICAL RESOURCE PROTOCOLS

1.0 COMPENSATION CALCULATIONS

1.1 Desert Tortoise Compensation Calculation

These guidelines reflect the BLM habitat categorization as well as the type of projected disturbance. BLM habitat categories, ranging in decreasing importance from Category 1 to Category 3, were designed as management tools to ensure future protection and management of these areas and their associated desert tortoise populations. These categories are consequently based not solely on tortoise density and the quality of the habitat but also on land use conflicts and estimated local tortoise population trends. Category 1 habitat is considered essential to the maintenance of large, viable populations, is occupied by primarily medium- to high-density populations, and has resolvable land use conflicts. Category 3 habitat is not considered essential to the maintenance of viable populations, is occupied by low- to medium-density populations isolated from higher-density populations, and has unresolvable land use conflicts.

According to the BLM guidelines, the habitat compensation ratio is calculated according to the following formula:

$$\text{Compensation rate} = C + A + G + E + D$$

where

C	=	Category of habitat:	
		Category 2 habitat	1
		Category 1 habitat	2
A	=	Impact on adjacent lands:	
		No impact	0
		Impact that will reduce tortoise densities	0.5
G	=	Growth resulting from proposed project:	
		No growth	0
		Some growth	0.5
E	=	Existing disturbance:	
		Moderate to heavy	0
		Little to none	1.0
D	=	Duration of effect:	
		Less than 10 years	0
		Longer than 10 years	1.0

The compensation ratio is 1.0:1 for all Category 3 habitat. A habitat compensation ratio of 4.0:1 was calculated for impact on previously undisturbed Category 1 habitat adjacent to the existing Mojave pipeline right-of-way. The factors in the compensation ratio formula were applied as follows:

- Factor A — Land adjacent to the proposed project would not be indirectly impacted (A = 0).
- Factor G — The proposed project would not have any growth-inducing impact in the Mojave Desert (G = 0).
- Factor D — Clearing of previously undisturbed habitat would be considered a long-term impact as would the construction of permanent facilities such as compressor stations (D = 1).
- Factor E — It is assumed that little or no disturbance currently exists in the additional right-of-way that would be cleared outside the previously disturbed right-of-way (E = 1).

In areas previously disturbed by the existing Mojave pipeline, we recommend that an adjusted compensation ratio be used to compensate for the 4 years of recovery that will have occurred by the time construction on the proposed project is begun. Because redisturbance will extend the recovery time, the full compensation formula will be calculated and then reduced in proportion to the time expected for the existing disturbance to substantially recover. "Substantial recovery" is defined as recovery to:

- A perennial plant density of about 90 percent of the predisturbance density of plants nearly as large as the predisturbance plants.
- An annual plant productivity within 90 percent of that in the surrounding undisturbed area.
- Levels of food and cover sufficient for tortoises to forage and live.
- Soil conditions suitable for burrowing.

Using these criteria, we estimated the time required for substantial recovery to be 25 years; therefore, the compensation ratio of 4.0:1 calculated for the newly disturbed areas will be reduced by 4/25s or 0.16, where 4 equals the years of recovery that have occurred subsequent to construction of the existing pipeline and 25 equals the time required for substantial recovery.

1.2 San Joaquin Kit Fox Compensation Calculation

Compensation is proposed on the basis of the quality of the existing habitat lost and the time period of compensation. Mojave proposes to apply the same compensation formula used for the existing Mojave pipeline for kit fox and other endangered species that inhabit good-quality grassland or chenopod scrub habitats:

$$A_c \times T_c = \frac{A_i \times P_i \times Y}{E}$$

where

A_c = Acres of compensation (Value to be determined)

T_c = Period of compensation (Although compensation habitat will be held in perpetuity, this period has been set at 30 years for calculation purposes based on typical periods of loan amortization.)

A_i = Acres of impact

P_i = Period of impact defined as the time between the start of construction in the area to recovery of the area as wildlife habitat (Restoration times in the San Joaquin Valley were calculated by the agencies for the San Joaquin Valley Pipeline Project assuming that artificial reclamation procedures would be used including monitoring and repeat efforts where initial efforts are not successful, all of which are part of Mojave's reclamation program; we used a period of 5 years for grassland habitat and 18 years for chenopod scrub habitat.)

Y = Habitat yield ratio (A value of 3 is used in the formula based on an estimated effective yield of 0.33 gain in long-term carrying capacity.)

E = Existing condition (Existing condition values are based on the qualitative assessment of potential kit fox habitat presented in the above discussion; for calculation purposes, good-quality habitat is considered to have an existing condition value of 1.)

Compensation is proposed on the basis of the quality of the existing habitat lost and the time period of compensation. Mojave proposes to apply the same compensation formula used for the existing Mojave pipeline for kit fox and other endangered species that inhabit good quality grassland or chenopod scrub habitats:

$$A_c \times T_c = \frac{A_i \times P_i \times Y}{E}$$

where

A_c = Acres of compensation (value to be determined)

T_c = Period of compensation (Although compensation habitat will be held in perpetuity, this period has been set at 30 years for calculation purposes based on typical periods of loan amortization.)

A_i = Acres of impact

P_i = Period of impact defined as the time between the start of construction in the area to recovery of the area as wildlife habitat (Restoration times in the San Joaquin Valley were calculated by the agencies for the San Joaquin Valley Pipeline Project assuming that artificial reclamation procedures would be used including monitoring and repeat efforts where initial efforts are not successful, all of which are part of Mojave's reclamation program; for the purposes of this assessment, a period of 5 years will be used for grassland habitat and 18 years for chenopod scrub habitat.)

Y = Habitat yield ratio (A value of 3 is used in the formula based on an estimated effective yield of 0.33 gain in long-term carrying capacity.)

E = Existing condition (Existing condition values are based on the qualitative assessment of potential kit fox habitat presented in the above discussion; for calculation purposes, good-quality habitat is considered to have an existing condition value of 1.)

SAN JOAQUIN KIT FOX PROTOCOL

STANDARDIZED RECOMMENDATIONS
FOR PROTECTION OF THE SAN JOAQUIN KIT FOX

April, 1989

Introduction:

This document summarizes mitigation actions recommended by the U.S. Fish and Wildlife Service (FWS) to protect the federally endangered San Joaquin kit fox during construction projects and other types of developments and activities. Its purpose is to make information on kit fox protection strategies readily available to developers and other interested persons and groups, and to help standardize the methods and definitions currently employed to achieve kit fox protection. The following measures are advisory in nature and do not represent legal requirements. However, taken together or in part they do represent a comprehensive strategy considered necessary by FWS to protect the San Joaquin kit fox from the direct, indirect, and cumulative effects of development projects. Implementation of these measures may be necessary to avoid violating the provisions of the Endangered Species Act of 1973, as amended (Act), including the prohibition against "incidental take" (defined as the killing, harming, or harassment of a listed species that is incidental to, but not the primary purpose of, an otherwise lawful activity). Such measures may also be required under the terms of a biological opinion pursuant to Section 7 of the Act or an incidental take permit pursuant to Section 10 of the Act. The following list includes many of the kit fox protection measures typically employed to date, but it is not by itself intended to serve as a mitigation plan or agreement or to obviate the need for formal compliance under Sections 7 and 10 of the Act. The specific measures implemented to protect kit fox for any given project shall be determined on a case-by-case basis in consultation with FWS, utilizing these and possibly other mitigation measures. The measures outlined in this document are subject to modification or revision at the discretion of FWS.

Part I: Pre-construction Conditions

1. Within 60 days prior to the beginning of construction activities or any project activity likely to impact the San Joaquin kit fox or other endangered or threatened species, pre-construction or pre-activity surveys should be conducted by a qualified biologist on all project areas. A qualified biologist means any person who has completed at least four years of university training in wildlife biology or a related science and has demonstrated field experience in the identification and life history of the San Joaquin kit fox. Surveys should determine the presence or absence of kit fox on the project site(s), identify specific uses of the area by kit fox if possible, and assess the potential impacts to the species of the proposed activity. Survey methodologies should follow techniques acceptable to FWS; information on survey methods and biota report formats may be obtained from FWS if desired. If possible, San Joaquin kit fox surveys should be conducted between March 1 and July 31 when kit fox activities are easiest to detect.

2. Results of pre-construction or pre-activity surveys should be submitted to FWS in writing within two weeks after their completion. If a previous study was conducted before the pre-construction survey, such as a Biological Assessment, results of the pre-construction survey may be submitted in letter form and need address only essential information, e.g., number of kit fox dens located in the project area, their status, other kit fox activity identified, and a map showing specific locations. If no kit fox activity is identified by the pre-construction survey, a brief letter stating this will suffice. If no previous survey was conducted, results of the pre-construction survey should be submitted in full report format, including methods employed, results, discussion, etc.

3. Following these surveys and before project activities begin, protective exclusion zones should be established around all known and potential San Joaquin kit fox dens (den definitions are provided in the Appendix). The configuration of exclusion zones should be circular, with a radius of specified distance measured outward from the den entrance or cluster of entrances. The size (radius) of these zones will be determined on a project-specific basis in consultation with FWS. Construction-related and other project activities should be prohibited or greatly restricted within these exclusion zones. Only essential vehicle operation on existing roads and simple foot traffic should be permitted. Otherwise, all construction, vehicle operation, materials storage, or any other type of surface-disturbing activity should be prohibited within these zones.

4. To ensure protection, the exclusion zones for all known San Joaquin kit fox dens should be demarcated by fencing that encircles each den at the appropriate distance. Exclusion fencing should consist of large flagged stakes (4- to 5-foot metal or 1" x 1" wooden stakes) connected by heavy rope or cord. Each exclusion zone should be posted with two to three signs placed at equidistant points along the perimeter; each sign should identify the fenced zone as an environmentally sensitive area and state that no disturbance is permitted without prior authorization from appropriate project personnel or FWS. Exclusion zone fencing should be maintained until all construction-related or operational disturbances have been terminated. At that time, all fencing and signs should be removed to avoid attracting subsequent attention to the den. For potential dens, placement of three 4- to 5-foot flagged stakes at equidistant points 10 to 15 feet from the den entrance(s), and posting of a single sign beside one stake, will suffice to identify the den location; fencing will not be required but the exclusion zone must be observed.

Part II: Construction and Operational Conditions

5. Disturbance to all San Joaquin kit fox dens should be avoided to the extent possible. Protection of known and potential kit fox dens for use as shelter, escape cover, and reproduction, as outlined above, is vital to the survival of the species. However, FWS recognizes that in some cases avoidance of dens during construction and other types of activities is not possible or practical. Limited destruction of kit fox dens may, therefore, be permitted if avoidence is not a reasonable alternative, provided the following procedures are observed.

a. Prior to destruction of any known kit fox den, FWS should be notified in writing of the intent to destroy the subject den(s) and the reasons why alternate courses of action are not possible. FWS will review the proposal and will either concur or recommend alternate methods to avoid den destruction or reduce impacts. Destruction of known or suspected natal or pupping dens should be avoided during the breeding season (November 1 to July 31). Destruction of natal or pupping dens known to be currently occupied usually will not be permitted until the den has been vacated or the kit fox pups have dispersed. Therefore, project activities at some den sites may have to be postponed. Destruction of a potential den may proceed without prior notification to FWS if no current or previous use of the den by kit fox is known. as determined by a trained biologist. However, if any den thought to be a potential one is determined during destruction to be a currently or previously used kit fox den (e.g., if kit fox sign is found inside), then FWS should be informed immediately of the change in status and provisions for replacement dens will subsequently apply (see condition #17).

b. Prior to the authorized destruction of any known San Joaquin kit fox den, the den should be monitored for at least three consecutive days to determine its current status. Activity at the subject den can be monitored by placing tracking medium at its entrance(s) and by spotlighting. If no kit fox activity is observed during this period, the den should be destroyed immediately to preclude subsequent use. If kit fox activity is observed at the den during this period, the den should be monitored for at least five consecutive days from the time of the observation to allow any resident animal to move to another den during its normal activities. Use of the den can be discouraged during this period by partially plugging its entrance(s) with soil in such a manner that any resident animal can escape easily. Destruction of the den may begin when, in the judgement of the conducting biologist, the animal has moved to a different den. If the animal is still present after five or more consecutive days of plugging and monitoring, the den may have to be excavated when, in the judgement of the conducting biologist, it is temporarily vacant, for example during the animal's normal foraging activities.

c. Destruction of the den should be accomplished by careful excavation with hand tools until it is certain that no kit foxes are inside. The den should be fully excavated and then filled with dirt and compacted to ensure that kit foxes cannot reenter or use the den during the construction period. If at any point during excavation a kit fox is discovered inside the den, the excavation activity should cease immediately and monitoring of the den as described in part 5b. should be resumed. FWS may be contacted for advice if desired. Destruction of the den may be completed when, in the judgement of the conducting biologist, the animal has escaped from the partially destroyed den.

d. All kit fox den excavations and pre-excavation monitoring should be conducted by a trained biologist or under the direct supervision of a trained biologist. Staff biologists of the project proponent, if they have no experience with kit fox prior to the project, may conduct den excavations only if they are previously trained in the procedure by someone experienced in kit fox biology. The results of all cases of den destruction should be conveyed to FWS in writing within two weeks of their completion.

6. Areas subject to permanent and temporary construction disturbances and other types of project-related disturbance should be minimized. Project designs should limit or cluster permanent project features to the least area possible while still permitting project goals to be achieved. To minimize temporary disturbances, all project-related vehicle traffic should be restricted to established roads, construction areas, storage areas, staging and parking areas, and other project areas. Off-road traffic outside of designated project areas should be prohibited. Where practical, all staging, parking, and storage areas should be designated by flagged stakes connected by heavy rope or cord similar to exclusion zone fencing (see #4) and project-related activities should be contained within these areas. These areas should also be included in pre-construction surveys and, to the extent possible, should be established in locations disturbed by previous activities to prevent unnecessary further impacts. Limiting project-related disturbances is advantageous to the project proponent, because the extent of San Joaquin kit fox habitat impacted by the project and thus subject to habitat compensation and restoration measures may therefore be reduced (see Part III).

7. Project-related vehicles should observe a 20 mph speed limit in all project areas, except on county roads and State and Federal highways; this is especially important at night when kit fox are most active. To the extent possible, night time construction should be minimized.

8. To prevent inadvertent entrapment of kit foxes or other animals during the construction phase of a project, all excavated, steep-walled holes or trenches more than 2 feet deep should be covered at the close of each working day by plywood or similar materials, or provided with one or more escape ramps constructed of earth fill or wooden planks. Before such holes or trenches are filled, they should be thoroughly inspected for trapped animals. If at any time a trapped or injured kit fox is discovered, the procedures under condition #14 should be followed.

9. All construction pipes, culverts, or similar structures with a diameter of 4 inches or greater that are stored at a construction site for any one or more overnight periods should be thorougly inspected for kit foxes before the pipe is subsequently buried, capped, or otherwise used or moved in any way. Kit foxes may be attracted to den-like structures such as pipes and could enter stored pipe and subsequently become trapped or injured if this precaution is not exercized. If during inspection a kit fox is discovered inside a pipe, that section of pipe should not be moved, or if necessary should be moved only once to remove it from the path of construction activity, until the kit fox has escaped. In such a case, FWS may be contacted for advice if desired.

10. All food-related trash items such as wrappers, cans, bottles, and food scraps should be disposed of in closed containers only and regularly removed from a construction or other project site. Food items may attract kit fox into a project site at night, consequently exposing them to construction-related or other types of hazards.

11. To prevent harassment, mortality, or destruction of dens or burrows of endangered and sensitive species by dogs or cats, no pets should be permitted on project sites.

12. Use of rodenticides and herbicides in project areas with known kit fox occurrences should be restricted. This is necessary to prevent primary or secondary poisoning of kit foxes and the depletion of prey populations on which they depend. All uses of such compounds should observe label and other restrictions mandated by the U.S. Environmental Protection Agency, California Department of Food and Agriculture, and other State and Federal legislation, as well as additional project-related restrictions deemed necessary by FWS. If rodent control must be conducted, zinc phosphide should be used because of its proven low risk to kit fox.

13. An employee education program should be conducted for any project that has expected impacts to kit fox or other endangered species. The program should consist of a brief consultation in which persons knowledgeable in kit fox biology and legislative protection explain endangered species concerns to officers and supervisors in charge of a project; officers and supervisors should subsequently relate these concerns to their subordinates. The program should include a description of the San Joaquin kit fox and its habitat needs, and should address occurrence of the kit fox in the project area, status of the species and its protection under the Endangered Species Act, and measures being taken to reduce impacts to the species during project construction or implementation. A fact sheet conveying this information should be prepared for distribution to all contractors, their employees, and military and agency personnel involved in the subject project.

14. Any contractor, employee(s), or military or agency personnel who inadvertently kills or injures a San Joaquin kit fox or who finds a dead, injured, or entrapped San Joaquin kit fox should report the incident immediately to his or her immediate supervisor. In the case of trapped animals, escape ramps or structures should be installed immediately if possible to allow the animal(s) to escape, or FWS should be contacted for advice. In the case of dead or injured kit foxes, FWS should be notified in writing within three working days of the finding of any such animal (see #18). Notification must include the date, time, and location of the incident and any other pertinent information. FWS contacts for this information are Mr. David Harlow or Mr. Gail Kobetich (916/978-4866 or FTS 460-4866). Any kit fox or other endangered species found dead or injured must be turned over immediately to the California Department of Fish and Game (CDFG) for care or analysis. The Department contact is Dr. Larry Eng (916/445-1383).

Part III: Habitat Compensation and Restoration

15. San Joaquin kit fox habitat permanently and unavoidably lost to development or subject to temporary disturbance because of project-related activities should be subject to compensation that offsets the area lost through permanent protection of an appropriate area of intact habitat. The amount of habitat permanently protected (i.e., the ratio of area protected to area disturbed) should be determined on a project-specific

basis in consultation with the U.S. Fish and Wildlife Service, utilizing formulas that have been computed and applied in similar projects. Agreeing to habitat loss compensation, however, does not relieve the project proponent of the kit fox protection measures described under Parts I and II of this document. Such protection measures are designed to limit incidental take resulting from a given project, while habitat loss compensation is designed to offset the unavoidable take of kit foxes or their habitat resulting from the project. The area of a given project subject to habitat loss compensation should include any kit fox denning or foraging habitat known to be occupied or utilized by the species prior to that project.

16. Upon completion of a construction or other type of project, all areas subject to temporary ground disturbance, including storage and staging areas, temporary roads, pipeline corridors, etc. should be recontoured if necessary and revegetated to promote restoration of the area to pre-project conditions. An area subject to "temporary" disturbance means any area that is necessarily disturbed during the construction or other initial phase of a project, but that after construction or other initial phases are completed is not subject to further disturbance in the carrying out of project activities. Appropriate methods and plant species used to revegetate such areas should be determined on a site-specific basis in consultation with FWS, CDFG, and revegetation experts. To the extent possible, local plant species or California native plant species should be used. Disturbed areas should be monitored regularly and reseeded as necessary until the area has returned to pre-project conditions. Areas temporarily disturbed but revegetated in this manner are subject only partially to the habitat compensation measures described in condition #15. In such cases, a lowered habitat loss compensation ratio is computed to account for revegetation efforts.

17. Any known kit fox den that is unavoidably destroyed during a project should be replaced with an artificial den. This will compensate for the loss of important shelter used by kit foxes for protection, reproduction, and escape from predators. Replacement dens are particularly important in areas where den availability appears to be limiting. Den design and placement should be determined on a site-specific basis in consultation with FWS, CDFG, and kit fox experts. Any den originally thought to be a potential den that is found during its excavation to contain evidence of kit fox use should be subject to replacement.

18. Any project-related information required by FWS or questions concerning the above conditions or their implementation may be directed in writing to the U.S. Fish and Wildlife Service, Sacramento Endangered Species Office, 2800 Cottage Way, Room E-1823, Sacramento, California 95825, or by phone at 916/978-4866.

APPENDIX:
SAN JOAQUIN KIT FOX DEN DEFINITIONS

Introduction: San Joaquin kit fox dens typically consist of subterranean holes or burrows constructed in flat ground or in areas of low to moderate relief. Typical characteristics of kit fox dens include the following: (1) one or more entrances that are 5 to 8 inches in diameter and frequently are higher than they are wide; (2) den ejecta resulting from digging that forms dirt berms or ramps approximately 3 to 6 feet long adjacent to the entrances; (3) kit fox tracks, scat, or prey remains in the vicinity of the den; and (4) matted vegetation adjacent to the den entrances. However, the specific characteristics of individual dens may vary from the above description, and in some areas, for example in the northern part of the species' range, occupied kit fox dens may lack some or all of these features. Therefore, caution must be exercized in determining the status of any potential or unknown den. In some cases, otherwise typical dens may be constructed in man-made features such as the banks of sumps or roadbeds.

Known Den:	Any existing natural den or man-made structure for which conclusive evidence or strong circumstantial evidence can be shown that the den is used or has been used at any time in the past by the San Joaquin kit fox. Conclusive evidence of use may include reliable historical records, past or current radio-telemetry or spotlighting data, or any other appropriate data that, in the judgement of a qualified biologist, is reasonable proof that a given den is or has been used by the kit fox. Circumstantial evidence may include kit fox sign, such as tracks, scat, prey remains, or kit fox remains, or any other appropriate circumstantial evidence that, in the judgement of a qualified biologist, leads to a conclusion that a given den is or has been used by the kit fox. Because kit foxes change dens often, with the result that the status of a given den may change abruptly and frequently, FWS now discourages use of the terms "active" and "inactive" when referring to any kit fox den.
Potential Den:	Any natural den or burrow within the species' range that has entrances of appropriate dimensions to accommodate San Joaquin kit foxes for which, however, there is little to no evidence of kit fox use. Potential dens shall include the following: (1) any suitable unused den; (2) any den or burrow of another species (e.g., ground squirrel) that otherwise has appropriate characterisitics for kit fox use; or (3) any suitable den for which available evidence, in the judgement of a qualified biologist, is insufficient to conclude that it is or has been used by the kit fox.
Pupping Den:	Any known San Joaquin kit fox den (as defined above) used by kit foxes to whelp and/or rear their pups. Pupping dens may be larger with more numerous entrances than dens occupied exclusively by adults, and usually have denser concentrations of kit fox tracks, scat, and prey remains in the vicinity of

	the den, and entrances surrounded by a broader apron of matted vegetation. A natal den, defined as a den in which kit fox pups are actually whelped but not necessarily reared, is a more restrictive version of the pupping den. In practice, however, it is difficult to distinguish between the two; therefore, unless whelping inside a den can be confirmed, any den known to shelter pups should be considered a pupping den.
Atypical den:	Any known San Joaquin kit fox den that has been established in or in association with a man-made structure. Dens of this type include pipes, culverts, and diggings beneath concrete slabs and buldings.

SWAINSON'S HAWK PROTOCOL

State of California

Memorandum

To : Div. Chiefs - IFD, BDD, NHD, WMD
Reg. Mgrs. - Regions 1, 2, 3, 4

Date : November 8, 1994

From : **Department of Fish and Game**

Subject : Staff Report Regarding Mitigation for Impacts to Swainson's Hawks (*Buteo swainsoni*) in the Central Valley of California

I am hereby transmitting the Staff Report Regarding Mitigation for Impacts to Swainson's Hawks in the Central Valley of California for your use in reviewing projects (California Environmental Quality Act [CEQA] and others) and in developing 2081 Management Authorizations and 2090 Biological Opinions which may affect Swainson's hawk habitat in the Central Valley. The staff report has been developed during the last 18 months by the Environmental Services Division (ESD) in cooperation with the Wildlife Management Division (WMD) and Regions 1, 2, and 4. It has been sent out for public review on several occasions and redrafted as appropriate.

Either the mitigation measures in the staff report may be used or project specific measures may be developed. Alternative project specific mitigation measures proposed by the Department Divisions/Regions or by project sponsors will also be considered. However, such mitigation measures must be submitted to ESD for review. The review process will focus on the consistency of the proposed measure with Department, Fish and Game Commission, and legislative policy and with laws regarding raptors and listed species. ESD will coordinate project specific mitigation measure review with WMD.

If you have any questions regarding the report, please contact Mr. Ron Rempel, Program Supervisor, Habitat Conservation Planning and Endangered Species Permitting, Environmental Services Division at (916) 654-9980.

COPY Original signed by
A. Petrovich, Jr.
For
Boyd Gibbons
Direction

Enclosure

cc: Mr. Ron Rempel
Department of Fish and Game
Sacramento

file; d, exfile ✓, esd, chron
Vouchilas/seh/pdl SRPBUTEO.DS1

Staff Report regarding Mitigation for Impacts to Swainson's Hawks (*Buteo swainsoni*) in the Central Valley of California

INTRODUCTION

The Legislature and the Fish and Game Commission have developed the policies, standards and regulatory mandates which, if implemented, are intended to help stabilize and reverse dramatic population declines of threatened and endangered species. In order to determine how the Department of Fish and Game (Department) could judge the adequacy of mitigation measures designed to offset impacts to Swainson's hawks in the Central Valley, Staff (WMD, ESD and Regions) has prepared this report. To ensure compliance with legislative and Commission policy, mitigation requirements which are consistent with this report should be incorporated into: (1) Department comments to Lead Agencies and project sponsors pursuant to the California Environmental Quality Act (CEQA); (2) Fish and Game Code Section 2081 Management Authorizations (Management Authorizations); and (3) Fish and Game Code Section 2090 Consultations with State CEQA Lead Agencies.

The report is designed to provide the Department (including regional offices and divisions), CEQA Lead Agencies and project proponents the context in which the Environmental Services Division (ESD) will review proposed project specific mitigation measures. This report also includes "model" mitigation measures which have been judged to be consistent with policies, standards and legal mandates of the Legislature and Fish and Game Commission. Alternative mitigation measures, tailored to specific projects, may be developed if consistent with this report. Implementation of mitigation measures consistent with this report are intended to help achieve the conservation goals for the Swainson's hawk and should complement multi-species habitat conservation planning efforts currently underway.

The Department is preparing a recovery plan for the species and it is anticipated that this report will be revised to incorporate recovery plan goals. It is anticipated that the recovery plan will be completed by the end of 1995. The Swainson's hawk recovery plan will establish criteria for species recovery through preservation of existing habitat, population expansion into former habitat, recruitment of young into the population, and other specific recovery efforts.

During project review the Department should consider whether a proposed project will adversely affect suitable foraging habitat within a ten (10) mile radius of an active (used during one or more of the last 5 years) Swainson's hawk nest(s). Suitable Swainson's hawk foraging habitat will be those habitats and crops identified in Bechard (1983), Bloom (1980), and Estep (1989). The following vegetation types/agricultural crops are considered small mammal and insect foraging habitat for Swainson's hawks:

- alfalfa
- fallow fields
- beet, tomato, and other low-growing row or field crops
- dry-land and irrigated pasture
- rice land (when not flooded)
- cereal grain crops (including corn after harvest)

The ten mile radius standard is the flight distance between active (and successful) nest sites and suitable foraging habitats, as documented in telemetry studies (Estep 1989, Babcock 1993). Based on the ten mile radius, new development projects which adversely modify nesting and/or foraging habitat should mitigate the project's impacts to the species. The ten mile foraging radius recognizes a need to strike a balance between the biological needs of reproducing pairs (including eggs and nestlings) and the economic benefit of development(s) consistent with Fish and Game Code Section 2053.

Since over 95% of Swainson's hawk nests occur on private land, the Department's mitigation program should include incentives that preserve agricultural lands used for the production of crops, which are compatible with Swainson's hawk foraging needs, while providing an opportunity for urban development and other changes in land use adjacent to existing urban areas.

LEGAL STATUS

Federal

The Swainson's hawk is a migratory bird species protected under the Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. 703-711). The MBTA makes it unlawful to take, possess, buy, sell, purchase, or barter any migratory bird listed in Section 50 of the Code of Federal Regulations (C.F.R.) Part 10, including feathers or other parts, nests, eggs or products, except as allowed by implementing regulations (50 C.F.R. 21).

State

The Swainson's hawk has been listed as a threatened species by the California Fish and Game Commission pursuant to the California Endangered Species Act (CESA), see Title 14, California Code of Regulations, Section 670.5(b)(5)(A).

LEGISLATIVE AND COMMISSION POLICIES, LEGAL MANDATES AND STANDARDS

The FGC policy for threatened species is, in part, to: "Protect and preserve all native species...and their habitats...." This policy also directs the Department to work with all interested persons to protect and preserve sensitive resources and their habitats. Consistent with this policy and direction, the Department is enjoined to implement measures that assure protection for the Swainson's hawk.

The California State Legislature, when enacting the provisions of CESA, made the following findings and declarations in Fish and Game Code Section 2051:

> a) "Certain species of fish, wildlife, and plants have been rendered extinct as a consequence of man's activities, untempered by adequate concern and conservation";
>
> b) "Other species of fish, wildlife, and plants are in danger of, or threatened with, extinction because their habitats are threatened with destruction, adverse modification, or severe curtailment because of overexploitation, disease, predation, or other factors (emphasis added)";and
>
> c) "These species of fish, wildlife, and plants are of ecological, educational, historical, recreational, esthetic, economic, and scientific value to the people of this state, and the conservation, protection, and enhancement of these species and their habitat is of statewide concern" (emphasis added).

The Legislature also proclaimed that it "is the policy of the state to conserve, protect, restore, and enhance any endangered or threatened species and its habitat and that it is the intent of the Legislature, consistent with conserving the species, to acquire lands for habitat for these species" (emphasis added).

Section 2053 of the Fish and Game Code states, in part, "it is the policy of the state that state agencies should not approve projects as proposed which would jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of habitat essential to the continued existence of those species, if there are reasonable and prudent alternatives available consistent with conserving the species and or its habitat which would prevent jeopardy" (emphasis added).

Section 2054 states "The Legislature further finds and declares that, in the event specific economic, social, and or other conditions make infeasible such alternatives, individual projects may be approved if appropriate mitigation and enhancement measures are provided" (emphasis added).

Loss or alteration of foraging habitat or nest site disturbance which results in:

(1) nest abandonment; (2) loss of young; (3) reduced health and vigor of eggs and/or nestlings (resulting in reduced survival rates), may ultimately result in the take (killing) of nestling or fledgling Swainson's hawks incidental to otherwise lawful activities. The taking of Swainson's hawks in this manner can be a violation of Section 2080 of the Fish and Game Code. This interpretation of take has been judicially affirmed by the landmark appellate court decision pertaining to CESA (DFG v. ACID, 8 CA App.4, 41554). The essence of the decision emphasized that the intent and purpose of CESA applies to all activities that take or kill endangered or threatened species, even when the taking is incidental to otherwise legal activities. To avoid potential violations of Fish and Game Code Section 2080, the Department recommends and encourages project sponsors to obtain 2081 Management Authorizations for their projects.

Although this report has been prepared to assist the Department in working with the development community, the prohibition against take (Fish and Game Code Section 2080) applies to all persons, including those engaged in agricultural activities and routine maintenance of facilities. In addition, sections 3503, 3503.5, and 3800 of the Fish and Game Code prohibit the take, possession, or destruction of birds, their nests or eggs.

To avoid potential violation of Fish and Game Code Section 2080 (i.e. killing of a listed species), project-related disturbance at active Swainson's hawk nesting sites should be reduced or eliminated during critical phases of the nesting cycle (March 1 - September 15 annually). Delineation of specific activities which could cause nest abandonment (take) of Swainson's hawk during the nesting period should be done on a case-by-case basis.

CEQA requires a mandatory findings of significance if a project's impacts to threatened or endangered species are likely to occur (Sections 21001 {c}, 21083, Guidelines Sections 15380, 15064, 15065). Impacts must be avoided or mitigated to less than significant levels unless the CEQA Lead Agency makes and supports findings of Overriding Consideration. The CEQA Lead Agency's Findings of Overriding Consideration does not eliminate the project sponsor's obligation to comply with Fish and Game Code Section 2080.

NATURAL HISTORY

The Swainson's hawk (*Buteo swainsoni*) is a large, broad winged buteo which frequents open country. They are about the same size as a red-tailed hawk (*Buteo jamaicensis*), but trimmer, weighing approximately 800-1100 grams (1.75 - 2 lbs). They have about a 125 cm. (4+foot) wingspan. The basic body plumage may be highly variable and is characterized by several color morphs - light, dark, and rufous. In dark phase birds, the entire body of the bird may be sooty black. Adult birds generally have dark backs. The ventral or underneath sections may be light with a characteristic dark, wide "bib" from the lower throat down to the upper breast, light colored wing linings and pointed wing tips. The tail is gray ventrally with a subterminal dusky band, and narrow, less conspicuous barring proximally. The sexes are similar in appearance; females however, are slightly larger and heavier than males, as is the case in most sexually dimorphic raptors. There are no recognized subspecies (Palmer 1988).

The Swainson's hawk is a long distance migrator. The nesting grounds occur in northwestern Canada, the western U.S., and Mexico and most populations migrate to wintering grounds in the open pampas and agricultural areas of South America (Argentina, Uruguay, southern Brazil). The species is included among the group of birds known as "neotropical migrants". Some individuals or small groups (20-30 birds) may winter in the U.S., including California (Delta Islands). This round trip journey may exceed 14,000 miles. The birds return to the nesting grounds and establish nesting territories in early March.

Swainson's hawks are monogamous and remain so until the loss of a mate (Palmer 1988). Nest construction and courtship continues through April. The clutch (commonly 3-4 eggs) is generally laid in early April to early May, but may occur later. Incubation lasts 34-35 days, with both parents participating in the brooding of eggs and young. The young fledge (leave the nest) approximately 42-44 days after hatching and remain with their parents until they depart in the fall. Large groups (up to 100+ birds) may congregate in holding areas in the fall and may exhibit a delayed migration depending upon forage availability. The specific purpose of these congregation areas is as yet unknown, but is likely related to: increasing energy reserves for migration; the timing of migration; aggregation into larger migratory groups (including assisting the young in learning migration routes); and providing a pairing and courtship opportunity for unattached adults.

Foraging Requirements

Swainson's hawk nests in the Central Valley of California are generally found in scattered trees or along riparian systems adjacent to agricultural fields or pastures. These open fields and pastures are the primary foraging areas. Major prey items for Central Valley birds include: California voles (*Microtus californicus*), valley pocket gophers (*Thomomys bottae)*, deer mice (*Peromyscus maniculatus*), California ground squirrels (*Spermophilus beecheyi)*, mourning doves (*Zenaida macroura*), ring-necked pheasants (*Phasianus colchicus*), meadowlarks (*Sturnella neglecta*), other passerines, grasshoppers (*Conocephalinae* sp.), crickets (*Gryllidae* sp.), and beetles (Estep 1989). Swainson's hawks generally search for prey by soaring in open country and agricultural fields similar to northern hariers (*Circus cyaneus*) and ferruginous hawks (*Buteo regalis*). Often several hawks may be seen foraging together following tractors or other farm equipment capturing prey escaping from farming operations. During the breeding season, Swainson's hawks eat mainly vertebrates (small rodents and reptiles), whereas during migration vast numbers of insects are consumed (Palmer 1988).

Department funded research has documented the importance of suitable foraging habitats (e.g., annual grasslands, pasture lands, alfalfa and other hay crops, and combinations of hay, grain and row crops) within an energetically efficient flight distance from active Swainson's hawk nests (Estep pers. comm.). Recent telemetry studies to determine foraging requirements have shown that birds may use in excess of 15,000 acres of habitat or range up to 18.0 miles from the nest in search of prey (Estep 1989, Babcock 1993). The prey base (availability and abundance) for the species is highly variable from year to year, with major prey population (small mammals and insects) fluctuations occurring based on rainfall patterns, natural cycles and agricultural cropping and harvesting patterns. Based on these variables, significant acreages of potential foraging habitat (primarily agricultural lands) should be preserved per nesting pair (or aggregation of nesting pairs) to avoid jeopardizing existing populations. Preserved foraging areas should be adequate to allow additional Swainson's hawk nesting pairs to successfully breed and use the foraging habitat during good prey production years.

Suitable foraging habitat is necessary to provide an adequate energy source for breeding adults, including support of nestlings and fledglings. Adults must achieve an energy balance between the needs of themselves and the demands of nestlings and fledglings, or the health and survival of both may be jeopardized. If prey resources are not sufficient, or if adults must hunt long distances from the nest site, the energetics of the foraging effort may result in reduced nestling vigor with an increased likelihood of disease and/or starvation. In more extreme cases, the breeding pair, in an effort to assure their own existence, may even abandon the nest and young (Woodbridge 1985).

Prey abundance and availability is determined by land and farming patterns including crop types, agricultural practices and harvesting regimes. Estep (1989) found that 73.4% of observed prey captures were in fields being harvested, disced, mowed, or irrigated. Preferred foraging habitats for Swainson's hawks include:

- alfalfa;
- fallow fields;
- beet, tomato, and other low-growing row or field crops;
- dry-land and irrigated pasture;
- rice land (during the non-flooded period); and
- cereal grain crops (including corn after harvest).

Unsuitable foraging habitat types include crops where prey species (even if present) are not available due to vegetation characteristics (e.g. vineyards, mature orchards, and cotton fields, dense vegetation).

Nesting Requirements

Although the Swainson's hawk's current nesting habitat is fragmented and unevenly distributed, Swainson's hawks nest throughout most of the Central Valley floor. More than 85% of the known nests in the Central Valley are within riparian systems in Sacramento, Sutter, Yolo, and San Joaquin counties. Much of the potential nesting habitat remaining in this area is in riparian forests, although isolated and roadside trees are also used. Nest sites are generally adjacent to or within easy flying distance to alfalfa or hay fields or other habitats or agricultural crops which provide an abundant and available prey source. Department research has shown that valley oaks (*Quercus lobata*), Fremont's cottonwood (*Populus fremontii*), willows (*Salix* spp.), sycamores (*Platanus* spp.), and walnuts (*Juglans* spp.) are the preferred nest trees for Swainson's hawks (Bloom 1980, Schlorff and Bloom 1983, Estep 1989).

Fall and Winter Migration Habitats

During their annual fall and winter migration periods, Swainson's hawks may congregate in large groups (up to 100+ birds). Some of these sites may be used during delayed migration periods lasting up to three months. Such sites have been identified in Yolo, Tulare, Kern and San Joaquin counties and protection is needed for these critical foraging areas which support birds during their long migration.

Historical and Current Population Status

The Swainson's hawk was historically regarded as one of the most common and numerous raptor species in the state, so much so that they were often not given special mention in field notes. The breeding population has declined by an estimated 91% in California since the turn of the century (Bloom 1980). The historical Swainson's hawk population estimates are based on current densities and extrapolated based on the historical amount of available habitat. The historical population estimate is 4,284-17,136 pairs (Bloom 1980). In 1979, approximately 375 (± 50) breeding pairs of Swainson's hawks were estimated in California, and 280 (75%) of those pairs were estimated to be in the Central Valley (Bloom 1980). In 1988, 241 active breeding pairs were found in the Central Valley, with an additional 78 active pairs known in northeastern California. The 1989 population estimate was 430 pairs for the Central Valley and 550 pairs statewide (Estep, 1989). This difference in population estimates is probably a result of increased survey effort rather than an actual population increase.

Reasons for decline

The dramatic Swainson's hawk population decline has been attributed to loss of native nesting and foraging habitat, and more recently to the loss of suitable nesting trees and the conversion of agricultural lands. Agricultural lands have been converted to urban land uses and incompatible crops. In addition, pesticides, shooting, disturbance at the nest site, and impacts on wintering areas may have contributed to their decline. Although losses on the wintering areas in South America may occur, they are not considered significant since breeding populations outside of California are stable. The loss of nesting habitat within riparian areas has been accelerated by flood control practices and bank stabilization programs. Smith (1977) estimated that in 1850 over 770,000 acres of riparian habitat were present in the Sacramento Valley. By the mid-1980s, Warner and Hendrix (1984) estimated that there was only 120,000 acres of riparian habitat remaining in the Central Valley (Sacramento and San Joaquin Valleys combined). Based on Warner and Hendrix's estimates approximately 93% of the San Joaquin Valley and 73% of the Sacramento Valley riparian habitat has been eliminated since 1850.

MANAGEMENT STRATEGIES

Management and mitigation strategies for the Central Valley population of the Swainson's hawk should ensure that:

- suitable nesting habitat continues to be available (this can be accomplished by protecting existing nesting habitat from destruction or disturbance and by increasing the number of suitable nest trees); and

- foraging habitat is available during the period of the year when Swainson's hawks are present in the Central Valley (this should be accomplished by maintaining or creating adequate and suitable foraging habitat in areas of existing and potential nest sites and along migratory routes within the state).

A key to the ultimate success in meeting the Legislature's goal of maintaining habitat sufficient to preserve this species is the implementation of these management strategies in cooperation with project sponsors and local, state and federal agencies.

DEPARTMENT'S ROLES AND RESPONSIBILITIES IN PROJECT CONSULTATION AND ADMINISTRATION OF CEQA AND THE FISH AND GAME CODE

The Department, through its administration of the Fish and Game Code and its trust responsibilities, should continue its efforts to minimize further habitat destruction and should seek mitigation to offset unavoidable losses by (1) including the mitigation measures in this document in CEQA comment letters and/or as management conditions in Department issued Management Authorizations or (2) by developing project specific mitigation measures (consistent with the Commission's and the Legislature's mandates) and including them in CEQA comment letters and/or as management conditions in Fish and Game Code Section 2081 Management Authorizations issued by the Department and/or in Fish and Game Code Section 2090 Biological Opinions.

The Department should submit comments to CEQA Lead Agencies on all projects which adversely affect Swainson's hawks. CEQA requires a mandatory findings of significance if a project's impacts to threatened or endangered species are likely to occur (Sections 21001 {c}, 21083. Guidelines 15380, 15064, 15065). Impacts must be: (1) avoided; or (2) appropriate mitigation must be provided to reduce impacts to less than significant levels; or (3) the lead agency must make and support findings of overriding consideration. If the CEQA Lead Agency makes a Finding of Overriding Consideration, it does not eliminate the project sponsor's obligation to comply with the take prohibitions of Fish and Game Code Section 2080. Activities which result in (1) nest abandonment; (2) starvation of young; and/or (3) reduced health and vigor of eggs and nestlings may result in the take (killing) of Swainson's hawks incidental to otherwise lawful activities (urban development, recreational activities, agricultural practices, levee maintenance and similar activities. The taking of Swainson's hawk in this manner may be a violation of Section 2080 of the Fish and Game Code. To avoid potential violations of Fish and Game Code Section 2080, the Department should recommend and encourage project sponsors to obtain 2081 Management Authorizations.

In aggregate, the mitigation measures incorporated into CEQA comment letters and/or 2081 Management Authorizations for a project should be consistent with Section 2053 and 2054 of the Fish and Game Code. Section 2053 states, in part, "it is the policy of the state that state agencies should not approve projects as proposed which would jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of habitat essential to the continued existence of those species, if there are reasonable and prudent alternatives available consistent with conserving the species and or its habitat which would prevent jeopardy" . Section 2054 states: "The Legislature further finds and declares that, in the event specific economic, social, and or other conditions make infeasible such alternatives, individual projects may be approved if appropriate mitigation and enhancement measures are provided."

State lead agencies are required to consult with the Department pursuant to Fish and Game Code Section 2090 to ensure that any action authorized, funded, or carried out by that state agency will not jeopardize the continued existence of any threatened or endangered species. Comment letters to State Lead Agencies should also include a reminder that the State Lead Agency has the responsibility to consult with the Department pursuant to Fish and Game Code Section 2090 and obtain a written findings (Biological Opinion). Mitigation measures included in Biological Opinions issued to State Lead Agencies must be consistent with Fish and Game

Code Sections 2051-2054 and 2091-2092.

NEST SITE AND HABITAT LOCATION INFORMATION SOURCES

The Department's Natural Diversity Data Base (NDDB) is a continually updated, computerized inventory of location information on the State's rarest plants, animals, and natural communities. Department personnel should encourage project proponents and CEQA Lead Agencies, either directly or through CEQA comment letters, to purchase NDDB products for information on the locations of Swainson's hawk nesting areas as well as other sensitive species. The Department's Nongame Bird and Mammal Program also maintains information on Swainson's hawk nesting areas and may be contacted for additional information on the species.

Project applicants and CEQA Lead Agencies may also need to conduct site specific surveys (conducted by qualified biologists at the appropriate time of the year using approved protocols) to determine the status (location of nest sites, foraging areas, etc.) of listed species as part of the CEQA and 2081 Management Authorization process. Since these studies may require multiple years to complete, the Department shall identify any needed studies at the earliest possible time in the project review process. To facilitate project review and reduce the potential for costly project delays, the Department should make it a standard practice to advise developers or others planning projects that may impact one or more Swainson's hawk nesting or foraging areas to initiate communication with the Department as early as possible .

MANAGEMENT CONDITIONS

Staff believes the following mitigation measures (nos. 1-4) are adequate to meet the Commission's and Legislature's policy regarding listed species and are considered as preapproved for incorporation into any Management Authorizations for the Swainson's hawk issued by the Department. The incorporation of measures 1-4 into a CEQA document should reduce a project's impact to a Swainson's hawk(s) to less than significant levels. Since these measures are Staff recommendations, a project sponsor or CEQA Lead agency may choose to negotiate project specific mitigation measures which differ. In such cases, the negotiated Management Conditions must be consistent with Commission and Legislative policy and be submitted to the ESD for review and approval prior to reaching agreement with the project sponsor or CEQA Lead Agency.

Staff recommended Management Conditions are:

1. No intensive new disturbances (e.g. heavy equipment operation associated with construction, use of cranes or draglines, new rock crushing

activities) or other project related activities which may cause nest abandonment or forced fledging, should be initiated within 1/4 mile (buffer zone) of an active nest between March 1 - September 15 or until August 15 if a Management Authorization or Biological Opinion is obtained for the project. The buffer zone should be increased to 1/2 mile in nesting areas away from urban development (i.e. in areas where disturbance [e.g. heavy equipment operation associated with construction, use of cranes or draglines, new rock crushing activities] is not a normal occurrence during the nesting season). Nest trees should not be removed unless there is no feasible way of avoiding it. If a nest tree must be removed, a Management Authorization (including conditions to off-set the loss of the nest tree) must be obtained with the tree removal period specified in the Management Authorization, generally between October 1- February 1. If construction or other project related activities which may cause nest abandonment or forced fledging are necessary within the buffer zone, monitoring of the nest site (funded by the project sponsor) by a qualified biologist (to determine if the nest is abandoned) should be required . If it is abandoned and if the nestlings are still alive, the project sponsor shall fund the recovery and hacking (controlled release of captive reared young) of the nestling(s). Routine disturbances such as agricultural activities, commuter traffic, and routine facility maintenance activities within 1/4 mile of an active nest should not be prohibited.

2. Hacking as a substitute for avoidance of impacts during the nesting period may be used in unusual circumstances after review and approval of a hacking plan by ESD and WMD. Proponents who propose using hacking will be required to fund the full costs of the effort, including any telemetry work specified by the Department.

3. To mitigate for the loss of foraging habitat (as specified in this document), the Management Authorization holder/project sponsor shall provide Habitat Management (HM) lands to the Department based on the following ratios:

(a) Projects within 1 mile of an active nest tree shall provide:

- one acre of HM land (at least 10% of the HM land requirements shall be met by fee title acquisition or a conservation easement allowing for the active management of the habitat, with the remaining 90% of the HM lands protected by a conservation easement [acceptable to the Department] on agricultural lands or other suitable habitats which provide foraging habitat for Swainson's hawk) for each acre of development authorized (1:1 ratio); or

- one-half acre of HM land (all of the HM land requirements shall be met by fee title acquisition or a conservation easement [acceptable to the Department] which allows for the active management of the habitat for prey production on the HM lands) for each acre of development authorized (0.5:1 ratio).

(b) Projects within 5 miles of an active nest tree but greater than 1 mile from the nest tree shall provide 0.75 acres of HM land for each acre of urban development authorized (0.75:1 ratio). All HM lands protected under this requirement may be protected through fee title acquisition or conservation easement (acceptable to the Department) on agricultural lands or other suitable habitats which provide foraging habitat for Swainson's hawk.

(c) Projects within 10 miles of an active nest tree but greater than 5 miles from an active nest tree shall provide 0.5 acres of HM land for each acre of urban development authorized (0.5:1 ratio). All HM lands protected under this requirement may be protected through fee title acquisition or a conservation easement (acceptable to the Department) on agricultural lands or other suitable habitats which provide foraging habitat for Swainson's hawk.

4. Management Authorization holders/project sponsors shall provide for the long-term management of the HM lands by funding a management endowment (the interest on which shall be used for managing the HM lands) at the rate of $400 per HM land acre (adjusted annually for inflation and varying interest rates).

Some project sponsors may desire to provide funds to the Department for HM land protection. This option is acceptable to the extent the proposal is consistent with Department policy regarding acceptance of funds for land acquisition. All HM lands should be located in areas which are consistent with a multi-species habitat conservation focus. Management Authorization holders/project sponsors who are willing to establish a significant mitigation bank (> 900 acres) should be given special consideration such as 1.1 acres of mitigation credit for each acre preserved.

PROJECT SPECIFIC MITIGATION MEASURES

Although this report includes recommended Management Measures, the Department should encourage project proponents to propose alternative mitigation strategies that provide equal or greater protection of the species and which also expedite project environmental review or issuance of a CESA Management Authorization. The Department and sponsor may choose to conduct cooperative, multi-year field studies to assess the site's habitat value and determine its use by nesting and foraging Swainson's hawk. Study plans should include clearly defined criteria for judging the project's impacts on Swainson's hawks and the methodologies (days of monitoring, foraging effort/efficiency, etc.) that will be used.

The study plans should be submitted to the Wildlife Management Division and ESD for review. Mitigation measures developed as a result of the study must be reviewed by ESD (for consistency with the policies of the Legislature and Fish and Game Commission) and approved by the Director.

EXCEPTIONS

Cities, counties and project sponsors should be encouraged to focus development on open lands within already urbanized areas. Since small disjunct parcels of habitat seldom provide foraging habitat needed to sustain the reproductive effort of a Swainson's hawk pair, Staff does not recommend requiring mitigation pursuant to CEQA nor a Management Authorization by the Department for infill (within an already urbanized area) projects in areas which have less than 5 acres of foraging habitat and are surrounded by existing urban development, unless the project area is within 1/4 mile of an active nest tree.

REVIEW

Staff should revise this report at least annually to determine if the proposed mitigation strategies should be retained, modified or if additional mitigation strategies should be included as a result of new scientific information.

LITERATURE CITED

Babcock, K.W. 1993. Home range and habitat analysis of Swainson's hawks in West Sacramento. Michael Brandman Associates report prepared for the Southport Property Owner's Group, City of West Sacramento, CA. 21pp.

Bechard, M.J. 1983. Food supply and the occurrence of brood reduction in Swainson's Hawk. Wilson Bull. 95(2):233-242.

Bloom, P.H. 1980. The status of the Swainson's Hawk in California, 1979. Federal Aid in Wildlife Restoration, Project W-54-R-12, Nongame Wildl. Invest. Job Final Report 11-8.0. 24p + appendix.

Estep, J.A. 1989. Biology, movements, and habitat relationships of the Swainson's Hawk in the Central Valley of California, 1986-87. Calif. Dept. Fish and Game, Nongame Bird and Mammal Section Report, 53pp.

Palmer, R.S. 1988a. Handbook of North American birds. Vol. 4: diurnal raptors (part 1). Yale Univ. Press, New Haven, CT.

Palmer, R.S. 1988b. Handbook of North American birds. Vol. 5: diurnal raptors (part 2). Yale Univ. Press, New Haven, CT.

Schlorff, R.W. and P.H. Bloom. 1983. Importance of riparian systems to nesting Swainson's Hawks in the Central Valley of California. pp 612-618. In: R.E Warner and K.M. Hendrix, (Eds.). 1984. California Riparian Systems. University of California Press, Berkeley.

Smith, F. 1977. Short review of the status of riparian forests in California. In: Stet, A. (Ed.). Riparian forests in California: Their ecology and conservation. Inst. of Ecology Publ. 15. Univ. of Calif. , Davis.

Warner, R.E. and K. M. Hendrix, Eds. 1984. California riparian systems; ecology, conservation, and productive management. University of California Press, Berkeley.

Woodbridge, B. 1985. Biology and management of Swainson's Hawk in Butte Valley, California. U.S. Forest Service Report, 19pp.

BURROWING OWL PROTOCOL

DRAFT
STAFF REPORT ON BURROWING OWL MITIGATION

Introduction

The Legislature and the Fish and Game Commission have developed the policies, standards and regulatory mandates to protect native species of fish and wildlife. In order to determine how the Department of Fish and Game (Department) could judge the adequacy of mitigation measures designed to offset impacts to burrowing owls *(Speotyto cunicularia)* staff (WMD, ESD and Regions) has prepared this report. To ensure compliance with legislative and commission policy, mitigation requirements which are consistent with this report should be incorporated into: (1) Department comments to Lead Agencies and project sponsors pursuant to the California Environmental Quality Act (CEQA); and (2) other authorizations the Department gives to project proponents for projects impacting burrowing owls.

This report is designed to provide the Department (including regional offices and divisions), CEQA Lead Agencies and project proponents the context in which the Environmental Services Division (ESD) will review proposed project specific mitigation measures. This report also includes preapproved mitigation measures which have been judged to be consistent with policies, standards and legal mandates of the Legislature, the Fish and Game Commission and the Department's public trust responsibilities. Implementation of mitigation measures consistent with this report are intended to help achieve the conservation of burrowing owls and should compliment multi-species habitat conservation planning efforts currently underway.

A range-wide conservation strategy for this species should also be prepared. Any range-wide conservation strategy should establish criteria for avoiding the need to list the species pursuant to either the California or federal Endangered Species Acts through preservation of existing habitat, population expansion into former habitat, recruitment of young into the population, and other specific efforts.

California's burrowing owl population is clearly declining and, if declines continue, the species may qualify for listing. Because of the intense pressure for development of suitable burrowing owl nesting and foraging habitat (open, flat and gently rolling grasslands and grass/shrub lands) in California, conflicts between owls and development projects often occur. Owl survival can be affected by disturbance and foraging habitat loss even when impacts to individual birds and nests/burrows are avoided. Inadequate information about the presence of owls is available prior to project approval if often lacking. Following project approval there is no legal mechanism through which to seek mitigation other than avoidance of occupied burrows or nests. The absence of standardized survey methods often impedes consistent impact assessment.

Burrowing Owl Habitat Description

Burrowing owl habitat can be found in annual and perennial grasslands, deserts, arid scrublands characterized by low-growing vegetation (Zarn 1974). Suitable owl habitat may also include trees and shrubs if the canopy covers less than 30 percent of the ground surface. Burrows are the essential component of burrowing owl habitat. Both natural and artificial burrows provide protection, shelter, and nests for burrowing owls (Henny and Blus 1981). Burrowing owls typically use burrows made by fossorial mammals, such as ground squirrels or badgers, but also may use man-made structures such as cement culverts; cement, asphalt, or wood debris piles; or openings beneath cement or asphalt pavement.

Occupied Burrowing Owl Habitat

Burrowing owls may use a site for breeding, wintering, foraging, and/or migration stopovers. Occupancy of suitable burrowing owl habitat can be verified at a site by detecting a burrowing owl, its molted feathers, cast pellets, prey remains, eggshell fragments, or excrement at or near a burrow entrance. Burrowing owls exhibit high site fidelity, reusing burrows year after year (Rich 1984, Feeney 1992). A site should be assumed occupied if at least one burrowing owl has been observed occupying a burrow there within the last three years (Rich 1984).

Project Review

The measures included in this report are intended to provide a decision-making process that should be implemented whenever there is potential for an action or project to adversely affect burrowing owls. For projects subject to the California Environmental Quality Act (CEQA), the process begins by conducting surveys to determine if burrowing owls are foraging or nesting on or adjacent to the project site. If surveys confirm that the site is occupied habitat, mitigation measures to minimize impacts to burrowing owls, their burrows and foraging habitat should be incorporated into the CEQA document as enforceable conditions. The measures in this document are intended to conserve the species by protecting and maintaining viable populations of the species throughout their range in California. This may often result in protecting and managing habitat for the species at sites away from rapidly urbanizing/developing areas. Projects and situations vary and mitigation measures should be adapted to fit specific circumstances.

Projects not subject to CEQA review may have to be handled separately since the legal handle the Department has to deal with burrowing owls in this situation are often limited.

Legal Status

The burrowing owl is a migratory bird species protected by international treaty under the Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. 703-711). The MBTA makes it unlawful to take, possess, buy, sell, purchase, or barter any migratory bird listed in 50 C.F.R. Part 10, including feathers or other parts, nests, eggs, or products, except as allowed by implementing regulations (50 C.F.R. 21). Sections 3503, 3503.5, and 3800 of the California Department of Fish and Game Code prohibit the take, possession, or destruction of birds, their nests or eggs. To avoid violation of the take provisions of these laws generally requires that project-related disturbance at active nesting territories be reduced or eliminated during critical phases of the nesting cycle (March 1 - August 15, annually). Disturbance that causes nest abandonment and/or loss of reproductive effort (e.g., killing or abandonment of eggs or young) may be considered "talking" and is potentially punishable by fines and/or imprisonment.

The burrowing owl is a Species of Special Concern to California because of declines of suitable habitat and both localized and statewide population declines. Guidelines for the Implementation of the California Environmental Quality Act (CEQA) provide that a species be considered as endangered or "rare" regardless of appearance on a formal list for the purposes of the CEQA (Guidelines, Section 15380, subsections b and d). The CEQA requires a mandatory findings of significance if impacts to threatened or endangered species are likely to occur. (Sections 2 1001 (c), 21083. Guidelines 15380, 15064, 15065). To be legally adequate, mitigation measures must be capable of "avoiding the impact altogether by not taking a certain action or parts of an action"; "minimizing impacts by limiting the degree or magnitude of the action and its implementation"; "rectifying the impact by repairing, rehabilitating or restoring the impacted environment"; "or reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action." (Guidelines, Section 15370). Avoidance or mitigation to reduce impacts to less than significant levels must be included in a project or the CEQA lead agency must make and justify findings of overriding considerations.

Impact Assessment

Habitat Assessment

The project site and a 150 meter (approximately 500 ft.) buffer (where possible and appropriate based on habitat) should be surveyed to assess the presence of burrowing owls and their habitat (Thomsen 1971, Martin 1973). If occupied habitat is detected on or adjacent to the site, measures to avoid, minimize, or mitigate the project's impacts to the species should be incorporated into the project, including burrow preconstruction surveys to ensure avoidance of direct take. It is also recommended that preconstruction surveys be conducted if the species was not detected but is likely to occur on the project site.

Burrow surveys

Burrow surveys should be conducted by walking suitable habitat on the entire project site and (where possible) in areas within 150 meters (approx. 500 ft.) of the project impact zone. The 150-meter buffer zone is surveyed to identify burrows outside of the project area which may be impacted by factors such as noise and vibration (heavy equipment, etc.) during project construction. Pedestrian survey transects should be spaced to allow 100 percent visual coverage of the ground surface. The distance between transect center lines should be no more than 30 meters (approx. 100 ft.), and should be reduced to account for differences in terrain, vegetation density, and ground surface visibility. To effectively survey large projects (100 acres or larger), two or more surveyors should be used to walk adjacent transects. To avoid impacts to owls from surveyors, owls and/or occupied burrows should be avoided by a minimum of 50 meters (approx. 160 ft.). Disturbance to occupied burrows should be avoided during all seasons. Surveys should be conducted during both the wintering and nesting seasons, unless the species is detected on the first survey.

Definition of impacts

The following should be considered impacts to the species:

- Disturbance within 50 meters (approx. 160 ft.) which may result in harassment of owls at occupied burrows;
- Destruction of natural and artificial burrows (culverts, concrete slabs and debris piles that provide shelter to burrowing owls); and
- Destruction and/or degradation of foraging habitat adjacent (within 100 meters) of an occupied burrow(s).

Written Report

A report should be prepared for the Department that gives the results of the survey. The report should include:

- Date and time of visit(s) including weather and visibility conditions and survey methodology;

- A description of the site including location, size, topography, vegetation communities, and animals observed during visit(s);
- An assessment of habitat suitability for burrowing owls;
- A map and pictures of the site;
- Results of survey transects including a map showing the location of all burrow(s) (natural or artificial) and owl(s), including the numbers at each burrow if present and tracks, feathers, pellets, or other items (prey remains, animal scat);
- The behavior of owls during the surveys should be carefully recorded (from a distance) and included;
- Both winter and nesting season surveys should be summarized along with any productivity information and a map showing territorial boundaries and home ranges; and
- Any historical information (local bird club, Audubon society, other biologists, etc.) regarding the presence of burrowing owls on site should included.

Mitigation

The objective of these measures is to avoid and minimize impacts to burrowing owls at a project site and preserve habitat that will support viable owl populations. If burrowing owls are detected using the project area, mitigation measures to minimize and offset the potential impacts should be included as enforceable measures during the CEQA process.

Mitigation actions should be carried out prior to the burrowing owl breeding season, generally from February 1 through August 31 (Thomsen 1971, Zarn 1974). Since the timing of nesting activity may vary with latitude and climatic conditions, this time frame should be adjusted accordingly. Preconstruction surveys of suitable habitat at the project site(s) and buffer zone(s) should be conducted to ensure no additional burrowing owls have established territories since the initial surveys. If ground disturbing activities are delayed or suspended for more than 30 days after the preconstruction survey, the site should be resurveyed.

Although the mitigation measures may be included as enforceable project conditions in the CEQA process, it may also be desirable to formalize them in an Memorandum of Understanding (MOU) between the Department and the project sponsor. An MOU is needed when lands (fee title or conservation easement) are being transferred to the Department.

Specific Mitigation Measures

1. Occupied burrows should not be disturbed during the nesting season (February I through August 31) unless a qualified biologist approved by the Department verifies that either: (1) the birds have not begun egg-laying and incubation; or (2) that juveniles from the occupied burrows are foraging independently and capable of independent survival.

2. To offset the loss of foraging and burrow habitat, a minimum of 6.5 acres of foraging habitat (calculated on a 100-m (approx. 300 ft.) foraging radius around the burrow) per pair or unpaired resident bird, should be acquired and permanently protected. The protected lands should be adjacent to occupied burrowing owl habitat and at a location acceptable to the Department. The protected habitat should contribute to the long-term conservation of the species and the ecosystem(s) on which they depend.

3. When destruction of occupied burrows is unavoidable, existing unsuitable burrows should be enhanced (enlarged or cleared of debris) or created (by installing artificial burrows) in a ratio of 1:1 at the protected lands site.

4. If owls must be moved away from the disturbance area, passive relocation techniques should be used rather than trapping. At least one week should be allowed to accomplish this and allow the owls to acclimate to alternate burrows.

5. The project sponsor should provide funding for management and monitoring of the protected lands. The monitoring plan should include mitigation success criteria and an annual report to the California Department of Fish and Game.

Impact Avoidance

If avoidance is the preferred method of dealing with potential project impacts, then no disturbance should occur within 50 m (approx. 160 ft.) of occupied burrows during the nonbreeding season of September 1 through January 31 or within 75 m (approx. 250 ft.) during the breeding season of February 1 through August 31. Avoidance also requires that a minimum of 6.5 acres of foraging habitat be **permanently** preserved contiguous with occupied burrow sites for each pair of breeding burrowing owls (with or without dependent young) or single unpaired resident bird. The configuration of the protected habitat should be approved by the Department.

Active relocation

Owls should be excluded from burrows in the immediate impact zone and within a 50 *m* (approx. 160 ft.) buffer zone by installing one-way doors in burrow entrances. One-way doors should be left in place 48 hours to insure owls have left the burrow before excavation. One natural or artificial burrow should be provided for each burrow that will be excavated in the project impact zone. The project area should be monitored daily for one week to confirm owl use of burrows before excavating burrows in the immediate impact zone. Whenever possible, burrows should be excavated using hand tools and refilled to prevent reoccupation. Sections of flexible plastic pipe or burlap bags should be inserted into the tunnels during excavation to maintain an escape route for any animals inside the burrow.

Passive Relocation

One natural or artificial burrow should be provided for each burrow that will be excavated in the project impact zone. The project area should be monitored daily until the owls have relocated to the new burrow. The formerly occupied burrows may then be excavated. Whenever possible, burrows should be excavated using hand tools and refilled to prevent reoccupation. Sections of flexible plastic pipe or burlap bags should be inserted into the tunnels during excavation to maintain an escape route for any animals inside the burrow.

Projects not subject to regulatory action

The Department is often contacted regarding the presence of burrowing owls on construction sites, parking lots and other areas for which there is no CEQA action or for which the CEQA process has been completed. In these situations, the Department should seek to reach agreement with the project sponsor to implement the specific mitigation measures described above. If they are unwilling to do so, active relocation should not normally be an option, rather they should be advised that passive relocation is their only option.

Literature Cited

Feeney, L. 1992. Site fidelity in burrowing owls. Unpublished paper presented to Raptor Research Annual Meeting, November 1992. Seattle, Washington.

Haug, E. A. and L. W. Oliphant. 1990. Movements, activity patterns, and habitat use of burrowing owls in Saskatchewan. J. Wildlife Management 54:27-35.

Henny, C. J. and L. J. Blus. 1981. Artificial burrows provide new insight into burrowing owl nesting biology. Raptor Research 15:82-85.

Martin, D. J. 1973. Selected aspects of burrowing owl ecology and behavior. Condor 75:446-456.

Rich, T. 1984. Monitoring burrowing owl populations: Implications of burrow re-use. Wildlife Society Bulletin 12:178-180.

Thomsen, L. 1971. Behavior and ecology of burrowing owls on the Oakland Municipal Airport. Condor 73:177-192.

Zarn, M. 1974. Burrowing owl. U. S. Department of Interior, Bureau of Land Management. Technical Note T-N 250. Denver, Colorado. 25pp.

VALLEY ELDERBERRY LONGHORN BEETLE PROTOCOL

May 31, 1994

General Compensation Guidelines for the Valley Elderberry Longhorn Beetle

The valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) was listed as a threatened species in 1980 (45 Federal Register 52807). This animal is fully protected under the Endangered Species Act of 1973, as amended (Act). The larvae of the beetle feed and mature within elderberry (*Sambucus* sp.) shrubs. Use of the plants by the early stages of this insect, a wood borer, is very rarely apparent. Frequently, the only exterior evidence of use of the shrub is the exit hole created by the larvae prior to the pupal stage. The beetle has been found in elderberry plants with stems possessing a diameter of one inch or greater. The range of the animal extends from Redding south to Bakersfield and from the western foothills of the Sierra Nevada to the eastern foothills of the coast range (Barr 1991; U.S. Fish and Wildlife Service 1984).

An adequate survey should be completed by a qualified biologist for the valley elderberry longhorn beetle and its elderberry foodplant if the proposed project site is located within the range of the animal. The report should include the precise location of all elderberry shrubs, their height and diameter, the presence of adult exit holes and the general condition of the plants. A map should also be included with the report indicating the major vegetational communities present on site. The completed study should be sent to the U.S. Fish and Wildlife Service (Service) for review.

Take incidental to an otherwise lawful activity may be authorized by one of two procedures. If a Federal agency is involved with the permitting, funding, or carrying out of the project, then initiation of formal consultation between that agency and the Service pursuant to section 7 of the Act is required if it is determined that the proposed project may affect a federally listed species. Such consultation would result in a biological opinion that addresses the anticipated effects of the project to the listed species and may authorize a limited level of incidental take. If a Federal agency is not involved with the project, and federally listed species may be taken as part of the project, then an incidental take permit pursuant to section 10(a) of the Act would need to be obtained. The Service may issue such a permit upon completion of a satisfactory conservation plan for the listed species that would be affected by the project.

The following mitigations should be undertaken for the valley elderberry longhorn beetle:

Avoid Habitat Whenever Possible

1. Fence and flag each elderberry shrub or group of these plants so that the construction crew can avoid them. There should be a setback of at least twenty feet from the dripline of each elderberry shrub. The area must be designated to prevent isolation of the beetle population from other

populations located in adjacent areas. The area should be designated as habitat for the valley elderberry longhorn beetle in perpetuity.

Brief contractors on the requirements to avoid damaging the elderberry plants and the possible penalties for not complying with these provisions. These areas should be adequately signed with the following information: "This area is habitat of the valley elderberry longhorn beetle, a threatened species, and must not be disturbed. This species is protected by the Endangered Species Act of 1973, as amended. Violators are subject to prosecution, fines and imprisonment." The signs should be clearly readable from a distance of at least twenty feet.

Work crews should be informed about the status of the threatened valley elderberry longhorn beetle and the need to protect its elderberry host plant. All on-site personnel should receive instruction regarding the presence of the federally protected animal.

Transplant Elderberry Shrubs

Elderberry shrubs should be transplanted if they can not be avoided by the proposed project. All elderberry plants with a stem diameter of 1.0 inch or greater in size at ground level should be transplanted to a mitigation area. In some cases, a shrub that would be extremely difficult to remove because of access problems or one that is in such poor condition that it is unlikely to survive being transplanted may be exempted from this requirement at the Service's discretion.

A qualified biologist (monitor) should be on-site for the duration of the transplanting of the elderberry shrubs to insure that no unnecessary take of the valley elderberry longhorn beetle occurs. The biologist utilized should have the authority to stop all activities until appropriate corrective measures have been completed. The biologist should also be required to report violations immediately to the Service and the California Department of Fish and Game.

1. Timing.--Elderberry shrubs with stems equal to or greater than 1.0 inches in diameter in ground level should be transplanted when the plant is dormant (approximately November through the first two weeks in February) after they have lost their leaves and, thus, the plants essentially are not transpiring or actively growing. Planting during the non-growing season will reduce the shock to the plant and increase transplantation success.

2. Procedure to plant elderberry shrubs.

a. Cut tree back to 3 to 6 feet from the ground or to 50 percent of its height (whichever is greater) by removing branches and stems above this height. The trunk and all stems greater than 1.0 inches in diameter measured at ground level should be replanted.

b. Excavate a hole 3 to 4 feet deep to receive the planting;

c. Dig plant up using Vemeer spade, backhoe, front end loader, or other suitable equipment, taking as much of the root ball as possible, and replant immediately at the compensation site. Move plant only by the root ball. If the plant is to be moved and transplanted off site, wrap the root ball in burlap and secure with wire. Dampen burlap with water, as necessary, to keep root ball wet;

d. The elderberry shrub should be planted in a water retention basin 40 feet by 40 feet in size (1600 square feet). The root ball should be planted so it is level with the existing ground. Compact the soil sufficiently so that settlement does not occur. A basin 40 feet by 40 feet should be provided for every five seedling elderberry plants and associated native vegetation (see number 4 below);

e. Saturate soil with water. Do not use fertilizers or other supplements or paint the tips of stems with pruning substance as the effects of these compounds on the beetle are unknown;

f. Monitor to ascertain if additional watering is necessary:

1. if sandy, well-drained soil, plants may need to be watered weekly or possibly twice monthly;

2. if clay, poorly-drained soil, it may not be necessary to water after the initial saturation.

A drip watering system and timer would be ideal. However, in situations where this is not possible, a water truck or other apparatus may be used.

Sixteen hundred (1600) square feet should be provided for each avoided elderberry shrub; each transplanted elderberry shrubs; and every five seedling elderberry plants and associated native plants. The mitigation area should be designated as habitat for the valley elderberry longhorn beetle in perpetuity. The mitigation area should be designated to prevent isolation of the beetle population from other populations located in adjacent areas. A conservation easement or fee title for the mitigation area should be given to a resource agency or appropriate private organization. The fee title or conservation easement should include adequate funding that ensures management of the mitigation area in perpetuity. The Service should be provided with a map and written details specifically identifying the mitigation area prior to the initiation of the mitigation program.

3. Procedure to plant additional stems.--Each stem 1.0 inches or greater in diameter at ground level that is moved or destroyed will be replaced with seedling elderberry plants in the mitigation area using a ratio from 2:1 to 5:1. This replacement requirement applies even if the elderberry shrub is transplanted. Replacement stock should be obtained from local sources. The approval of the Service should be obtained prior to initiating the compensation program. The ratio is determined as follows:

Ratio of 2:1 Elderberry shrubs with stem diameters 1.0 inch or greater at ground level and there are no adult emergence holes.

Ratio of 3:1 Elderberry shrubs with stem diameters 1.0 inch or greater at ground level. Beetles are present as evidenced by emergence holes, but occur in 50 percent or less of the shrubs.

Ratio of 5:1 Elderberry shrubs with stem diameters 1.0 inch or greater in size at ground level. Beetles are present as evidenced by emergence holes, and occur in 51 percent or greater of the shrubs.

4. Plant associated native plants: Recent studies have found that beetles are more abundant in more dense native plant communities with a mature overstory and mixed understory versus a young overstory and low understory. Therefore, a mix of native plants associated with the elderberry shrubs at the

project site should be planted at a ratio of at least two specimens of all native tree and shrub species for every five elderberry stems equal to or greater than 1 inch in diameter at ground level. These plantings also must be monitored with the same survival criteria utilized for the elderberry plants. The saplings and seedlings, as appropriate, should be from native populations at the project site or from the immediate project vicinity. The approval by the Service of the native plant donor sites must be obtained prior to initiation of any of the revegetation work.

Example 1

Total number of elderberry shrubs on project site: 20
Associated native plants: interior live oak (*Quercus wislizenii*), foothill pine (*Pinus sabiniana*), and California buckeye (*Aesculus californica*)
Number of elderberry shrubs with evidence of the the valley elderberry longhorn beetle: 12
Number of stems equal or greater than 1 inch: 100
Compensation: Transplant the 20 elderberry shrubs that will be impacted, plant 500 elderberry seedlings (ratio of 5:1), plant 40 interior live oaks, 40 foothill pines, 40 California buckeyes
Total area required: 4.41 acres

Example 2

Total number of elderberry shrubs: 10
Associated native plants: interior live oak (*Quercus wislizenii*)
Number of elderberry shrubs with evidence of the valley elderberry longhorn beetle: 0
Number of stems greater or equal to 1.0 inch: 0
Compensation required - None

Example 3

Total number of elderberry shrubs: 5
Associated native plants: cottonwood (*Populus fremontii*)
Number of elderberry shrubs with evidence of the valley elderberry longhorn beetle: 0
Number of stems equal or greater than 1.0 inch: 15
Compensation required: Transplant the 5 elderberry shrubs, plant 30 elderberry seedlings (ratio 2:1), plant 6 cottonwoods
Total area required: .40 acre

Example 4

Total number of elderberry shrubs: 25
Associated native plants: none
Number of elderberry shrubs with evidence of the the valley elderberry longhorn beetle: 7
Number of stems equal or greater than 1.0 inch: 150
Compensation required: Transplant the 25 elderberry shrubs, plant 450 stems (ratio 3:1)
Total area required: 4.22 acres

Provide Habitat for the Beetle in Perpetuity

Weeds and other plants that are not native to the mitigation area should be removed at least once a year or at the discretion of the Service or the California Department of Fish and Game. Mechanical means should be used; herbicides should be prohibited.

Measures should be taken to insure that no pesticides, herbicides, or other chemical agents enters the mitigation area. No spraying of these agents should be conducted within one hundred (100) feet of the area or if they have the potential to drift, flow or be washed into the area in the opinion of biologists or law enforcement personnel from the California Department of Fish and Game or the Service. The Service should be provided with written documentation that this condition will be carried out in perpetuity.

No dumping of trash or other material should occur within the mitigation area. Any trash or other material should be removed within ten (10) working days of discovery. The Service should be provided with written documentation that this condition will be carried out in perpetuity.

Biologists and law enforcement personnel from the California Department of Fish and Game and the Service should be given complete access to the project site to monitor transplanting activities. Personnel from both these agencies should be given complete access to the project and the mitigation area to monitor the valley elderberry longhorn beetle and its elderberry shrub habitat in perpetuity.

If appropriate, permanent fencing should be placed completely around the mitigation area to prevent unauthorized entry by off-road vehicles, equestrians, or other parties that may damage or destroy the habitat of the beetle. The applicant should receive approval from the Service that the fencing is acceptable prior to initiation of the mitigation program.

If appropriate, a minimum of two prominent signs should be placed and maintained in perpetuity at the mitigation area noting that the site is habitat of the federally threatened valley elderberry longhorn beetle and including information on the beetle's biology and ecology. The signs should be approved by the Service. They should be replaced or repaired within ten (10) working days if they are found to be damaged or destroyed.

Monitoring Program

The population of the adults of the threatened valley elderberry longhorn beetle, the general condition of the mitigation area, and the elderberry plants and associated native plants located at the mitigation area should be monitored by a qualified biologist annually for a period of ten years beginning with the date the mitigation program is initiated. Two visits between February 14 and June 30 of each year should be made beginning the year the mitigation is begun. The study should include a population census of the adult beetles, including the actual number of animals observed, their condition, behavior, and precise location at the site; a census of the elderberry shrubs and associated native plants, including the number of plants observed, their size, and condition; and a general assessment of the habitat, including any real or potential threats to the beetle, and its food plants, such as erosion, excessive grazing by livestock, off-road vehicle use, etc. Random-walk counts should be used; mark-recapture or other methods that involve handling or harassment shall not be utilized. The materials and methods that will be utilized for this study should be reviewed and approved by the Service. All appropriate Federal and State permits should be obtained prior to initiating the field studies.

A written report analyzing the data from the monitoring of the threatened valley elderberry longhorn beetle at the mitigation area and the elderberry shrubs and associated native plants located at the project site should be conveyed to the Service and the Department of Fish and Game (Supervisor, Environmental Service, Department of Fish and Game, 1416 Ninth Street, Sacramento, California 95814, and Staff Zoologist, California Natural Diversity Data Base, Department of Fish and Game, 1220 S Street, Sacramento, California 95814) by December 31 of each year for a ten year period beginning with the date the program is initiated. The report should include, but not be limited to, the raw data collected during the field surveys and a basic analysis of the population dynamics of the valley elderberry longhorn beetle at the compensation sites. The population size (qualitative) should be estimated for the beetle. Maps showing where the individual adult beetles and exit holes were observed should be included. For the elderberry shrubs and associated native plants the following should be analyzed: the survival rate, condition, and size of the plants. Real and likely future threats should be addressed along with suggested mitigations (e.g. fencing access to off-road vehicles, more frequent removal of exotic vegetation, etc.). The original field notes, photographs, correspondence, and all other pertinent material, as well as a copy of the report should be deposited and accessioned into the Entomology Department, California Academy of Sciences, Golden Gate Park, San Francisco, California 94118 by December 31 of each year for a ten year period beginning with the date the mitigation program is initiated. The Sacramento Field Office should be provided with the accession numbers given to this material by the California Academy of Sciences.

Success Criteria

A survival rate of 80% of the elderberry shrubs and associated native plants should be obtained at the end of the ten year monitoring program. The Service will make the determination as to the compensator's replacement responsibilities arising from circumstances beyond its control such as plants damaged or killed as the result of severe flooding or vandalism.

Future Revisions

Revegetating with elderberries and the responses of the beetle to such revegetation efforts is a relatively new procedure. As data become available on which to evaluate this technique, revisions to these guidelines are anticipated.

Service Contact

These guidelines were prepared by Chris Nagano, Sacramento Field Office, U.S. Fish and Wildlife Service, 2800 Cottage Way, Room E-1823, Sacramento, California 95825. Please refer any questions on these guidelines to him at the above address or call 916/978-4866 extension 358.

Literature Cited

Barr, C.B. 1991. The distribution, habitat, and status of the valley elderberry longhorn beetle *Desmocerus californicus dimorphus*. Sacramento Field Office, U.S. Fish and Wildlife Service, Sacramento, California

U.S. Fish and Wildlife Service. 1984. Recovery plan for the valley elderberry longhorn beetle. Endangered Species Program. Portland, OR.

APPENDIX E

REFERENCES AND CONTACTS

All documents cited in the text are listed in part I below; where each document is available to the public is indicated as required by CEQA. Documents consulted by the staff for background information but not cited in the text are listed in part II. Persons contacted by the staff in the course of preparing this EIR/EIS are listed in part III.

I. DOCUMENTS CITED IN THE TEXT

Alameda County Planning Department. 1993. South Livermore Valley Area Plan. Available from the Alameda County Planning Department.

American Automobile Association. 1994. Tourbook — California and Nevada. Available at California State Automobile Association offices.

American Gas Association. 1986. An Analysis of Reportable Incidents for Natural Gas Transportation and Gathering Lines, 1970 Through June 1984. NG-18 Report No. 158, Pipeline Research Committee of the American Gas Association. Available at FERC offices.

__________. 1992. An Analysis of Reportable Incidents for Natural Gas Transportation and Gathering Lines, June 1984 Through 1990. Available at FERC offices.

Automobile Club of Southern California. 1993a. Southern and Central California Camping. Available at Automobile Club of Southern California offices.

__________. 1993b. Northern California Camping. Available at Automobile Club of Southern California offices.

Bay Area Air Quality Management District (Bay Area District). 1991. Air Quality and Urban Development: Guidelines for Assessing Impacts of Projects and Plans. Available at Bay Area District offices.

California Department of Conservation Division of Mines and Geology (DMG). 1992. Preliminary Fault Activity Map of California. DMG Open-FIle Report 92-03. Available at DMG offices.

California Department of Finance. 1993. California 1993 Statistical Abstract. Available at San Francisco Public Library and many other public libraries.

California Employment Development Division (EDD). 1992. Labor Market Information, Guides and Economic Research Group. As cited in California 1993 Statistical Abstract (California Department of Finance). Available at EDD offices.

California Gas and Electric Utilities. 1994. California Gas Report, 1994. Available at SLC offices.

California Native Plant Society (CNPS). 1994. Inventory of Rare and Endangered Vascular Plants of California. Available at SLC offices.

California Public Utilities Commission (CPUC). 1990. Pacific Gas Transmission Company/Pacific Gas and Electric Company Natural Gas Pipeline Project. Available at CPUC offices.

California State Fire Marshall (CSFM). 1993. Hazardous Liquid Pipeline Risk Assessment. Available at CSFM offices.

California State Lands Commission (SLC). 1990. Mojave-Kern River Pipeline Projects Environmental Impact Report Amendment. Available at SLC offices.

____________. 1991. Mojave-Kern River Pipeline Projects Environmental Impact Report Final Amendment. Available at SLC offices.

California State Lands Commission (SLC) and Federal Energy Regulatory Commission (FERC). 1987. Mojave-Kern River-El Dorado Natural Gas Pipeline Projects Final Environmental Impact Report/Environmental Impact Statement. Available at SLC or FERC offices.

California State Lands Commission (SLC) and U.S. Bureau of Land Management (BLM). 1987. San Joaquin Valley Pipeline Environmental Impact Report/Environmental Impact Statement. Available at SLC or BLM offices.

California State Water Resources Control Board (CSWRCB). 1990. 1990 Water Quality Assessment. Available at CSWRCB offices.

Contra Costa County Planning Department. 1993. Draft Environmental Impact Statement for the Proposed Buchanan Road ByPass Project. Available from the Contra Costa County Planning Department or the City of Pittsburg Planning Department.

Contra Costa Water District (CCWD). 1993. Final Stage 2 Environmental Impact Report/Environmental Impact Statement for the Los Vaqueros Project, Volumes I and II. Available at CCWD offices.

East Bay Regional Park District (EBRPD). 1988a. Promotional brochure on Contra Loma Regional Park. Available from the EBRPD.

____________. 1988b. Master Plan 1989. Available from the EBRPD.

____________. 1991. Promotional brochure on Black Diamond Mines Regional Preserve. Available from the EBRPD.

Environmental Science Associates. 1993. State Route 4 Bypass Project Draft Environmental Impact Report, Volumes I, II, and III. Prepared for the State Route 4 Bypass Authority. Available at State Route 4 Bypass Authority offices.

Federal Energy Regulatory Commission (FERC). 1990. Mojave-Kern River-WyCal Pipeline Projects Environmental Assessment. Available at FERC offices.

_____________. 1991. PGT/PG&E and Altamont Natural Gas Pipeline Projects Final Environmental Impact Statement. Available at FERC offices.

Firby, J.R. 1993. Paleontologic Characterization of the Mojave Pipeline Northward Expansion Project. Prepared for Mojave Pipeline Company. Available from the FERC or SLC to qualified professionals.

Firby, J.R., and H.E. Schorn. 1994. Paleontological Characterization of the Mojave Pipeline Northward Expansion Project, California, Phase I: Amendment. Prepared for Mojave Pipeline Company. Available from the FERC or SLC to qualified professionals.

Kleinfelder, Inc. 1994. Focused Environmental Contamination Pre-Screening Corridor Pre-Screening Studies, Mojave Pipeline Company Northward Expansion. Prepared for Mojave Pipeline Company. Available at SLC offices.

Lander, E.B. 1994. Evaluation of Paleontologic Characterization Technical Reports for Mojave Northward Expansion Project. Prepared for the FERC and SLC. Available from the FERC and SLC to qualified professionals.

National Safety Council. 1985. Accident Facts. Available from the National Safety Council.

Sacramento Metropolitan Air Quality Management District (Sacramento District). 1994. Air Quality Thresholds of Significance, (Workshop Draft). Available at Sacramento District offices.

South Coast Air Quality Management District (South Coast District). 1993. CEQA Air Quality Handbook. Available at South Coast District offices.

U.S. Army Corps of Engineers (USACE). 1987. Corps of Engineers Wetlands Delineation Manual. Available at USACE offices.

U.S. Department of Commerce. 1992. 1990 Census Summary, Population and Housing Statistics — California. Available at San Francisco Public Library and many other public libraries.

U.S. Department of the Interior, National Park Service. 1994. Juan Bautista de Anza National Historic Trail (Arizona - California) Comprehensive Management and Use Plan and Environmental Impact Statement, Map Supplement, Draft. Available at NPS offices.

U.S. Department of Transportation (DOT). 1988. Annual Report on Pipeline Safety - Calendar Year 1987. Office of Pipeline Safety. Available at FERC offices.

_____________. 1994. Pipeline Incidents and Accidents, January 1 - December 31, 1993. Office of Pipeline Safety. Available at FERC offices.

U.S. Environmental Protection Agency (EPA). 1978. Protective Noise Levels. Office of Noise Abatement and Control. EPA 550/9-79-100. Available at EPA libraries.

____________. 1991. Compilation of Air Pollution Emission Factors, Volume II, Mobile Sources. Supplement A. EPA Guidance AP-42. Available at EPA libraries.

U.S. Fish and Wildlife Service (FWS). 1989. Standardized Recommendations for Protection of the San Joaquin Kit Fox. Available at FERC offices.

____________. 1994. General Compensation Guidelines for the Valley Elderberry Longhorn Beetle. Available at FERC offices.

U.S. Geological Survey (USGS). 1989. Water Resources Data, California, Water Year 1988, Volume III. Available at USGS offices.

Williams, D.F. 1986. Mammalian Species of Special Concern in California. Prepared for the California Department of Fish and Game. Available at DFG offices.

Woodward-Clyde Consultants (WCC). 1993a. Application for Certificate of Public Convenience and Necessity under Part 157, Subpart E of the Commission's Regulations, Mojave Northward Expansion. Prepared for Mojave Pipeline Company. Available at SLC offices.

____________. 1993b. Amendment to Application for Certificate of Public Convenience and Necessity Under Part 157, Subpart E of the Commission's Regulations, Mojave Northward Expansion. Prepared for Mojave Pipeline Company. Available at SLC offices.

____________. 1993c. Draft Preliminary Field Report, Class III Cultural Resources Inventory. Prepared for Mojave Pipeline Company. Available from the SLC to qualified professionals.

____________. 1994. Amendment to Application for Certificate of Public Convenience and Necessity, Mojave Northward Expansion. Prepared for Mojave Pipeline Company. Available at SLC offices.

II. GENERAL REFERENCES

____________. 1994. East County Area Plan a Portion of the Alameda County General Plan, Volume I, Goals, Policies, and Programs.

Aspen Environmental Group. 1993. Pacific Pipeline Project Draft Environmental Impact Report Executive Summary. Prepared for California Public Utilities Commission.

California Department of Fish and Game (DFG). 1988. California's Wildlife, California Statewide Wildlife Habitat Relationships System, Volumes I, II, and III.

California Energy Commission (CEC). 1993. Final Staff Assesment SMUD Cogeneration Pipeline Project Application for Certification, Sacramento and Yolo Counties, California. December.

___________. 1994a. The 1992-1993 Biennial Energy Report of the California Energy Commission.

___________. 1994b. 1993 Fuels Report.

California Public Utilities Commission (CPUC). 1994a. Order Instituting Rulemaking on the Commission's Proposed Policies Governing Restructuring California Electric Services Industry and Regulations.

___________. 1994b. Resolution G-3127 PG&E Request Approval of the Long-term Firm Intra-State Gas Transportation Service (Tariff Schedule G-LT).

California, State of. 1993. California Statistical Abstract.

California Toll Road Company. 1994. Access.

Central Valley Project. 1993a. Central Valley Project Improvement Act Programmatic Environmental Impact Statement, Draft Phase II Report, Secondary Screening Report for Analytical Tools (Administrative Draft).

___________. 1993b. Central Valley Project Improvement Act Public Meeting Summary Report.

___________. 1994a. Central Valley Project Improvement Act Phase II Draft Response to Comments Report.

___________. 1994b. Central Valley Project Improvement Act Public Input Meetings Packet.

Chambers Group, Inc. 1991. Draft Environmental Impact Report for Proposed Geothermal Development for Certain State Lands Within the Geysers Area, Lake, Mendocino, and Sonoma Counties, California. Prepared for the SLC.

City of Fresno Development Department Planning Division. 1986. Chinatown - Expanded Redevelopment Planning Area.

City of Madera California. 1994. Zoning Maps/Demographics/Land Use.

City of Tracy and the Planning Center. 1993. Final Environmental Impact Report for the City of Tracy Urban Management Plan/General Plan 1993.

Consultants in Wildlife & Environmental Services Agency. 1989a. Survey for Desert Tortoises Along the Proposed Mojave Pipeline Route. Prepared for Woodward-Clyde Consultants.

___________. 1989b. Final Report, Survey for Plant Species of Special Concern and General Vegetation Inventory Along the Mojave Desert and Tehachapi Mountains Portion of the Proposed Mojave Pipeline Route. Prepared for Woodward-Clyde Consultants.

Dames and Moore. 1990. Kern River Pipeline Application for Authority to Construct Wyoming Muddy Creek Compressor Station. Prepared for Kern River Gas Transmission Company.

DeLorme Mapping. 1990. Southern & Central California Atlas & Gazetteer.

Ecology and Environment, Inc. (E & E). 1986a. San Joaquin Valley Pipeline Draft Environmental Impact Report/Environmental Impact Statement Air Quality Technical Appendix SCH No. 85122307.

____________. 1986b. San Joaquin Valley Pipeline Draft Environmental Impact Report/Environmental Impact Statement. Prepared for the SLC and BLM.

EDM Services, Inc. 1993. Hazardous Liquid Pipeline Risk Assessment. Prepared for California State Fire Marshal.

El Paso Natural Gas Company. 1992. Mojave Pipeline Northward Expansion (4 videotapes of route).

ESA Planning and Environmental Services. 1986. San Joaquin Valley Pipeline Biological Assessment. Prepared for the SLC and BLM.

Federal Energy Regulatory Commission (FERC). 1985. Mojave Pipeline Company Application for Certificate of Public Convenience and Necessity Environmental Report, Parts I and II, Volumes 2 and 3.

____________. 1987. Mojave-Kern River-El Dorado Natural Gas Pipeline Projects Final Supplement to the Final Environmental Impact Report/Environmental Impact Statement, Volume VI, WyCal Supplement.

____________. 1990a. Iroquois/Tennessee Phase I Pipeline Project Final Environmental Impact Statement, Volume I.

____________. 1990b. Niagara Import Point Project Final Environmental Impact Statement, Volume II, Comments and Responses.

____________. 1991a. PGT/PG&E and Altamont Natural Gas Pipeline Projects Draft Environmental Impact Statement Maps.

____________. 1991b. Programmatic Agreement among FERC, BLM, California and Arizona State Historic Preservation Officers and the Advisory Council on Historic Preservation Regarding the Mojave Pipeline Project.

____________. 1992. Northwest Pipeline Expansion Project Final Environmental Impact Statement, Volumes I, II, and III.

____________. 1993a. FGT Phase III Expansion Project Final Environmental Impact Statement, Volumes I and II.

____________. 19993b. West-East Crossover Project Final Environmental Impact Statement.

Hansen, R.B. 1993. Biological Resources Survey - Resource Conservation Element Update, Kings County General Plan.

Holland, R.F. 1986. Preliminary Descriptions of the Terrestrial Natural Communities of California.

Holloway, C., and R. Samra. 1994. Land Use Diagram (General Plan) From Sacramento County Board of Supervisors.

Jones and Stokes Associates, Inc. 1988. Guide to the California Wildlife Habitat-Relationships System.

____________. 1989. Los Vaqueros - Results of Biological Resource Inventories.

____________. 1990. Final Environmental Impact Report on PG&E Natural Gas Pipeline Project. Prepared for the California Public Utilities Commission.

Lake, D. 1994. Unusual and Significant Plants of Alameda and Contra Costa Counties. Third Edition.

MacArthur, R.S. 1986. Protocol for the San Joaquin Pipeline Air Quality Impact Assessment SYSAPP-86/073. Systems Applications, Inc.

Olson, B.L. 1994. Status of Rare, Threatened and Endangered Vascular Plants in Alameda and Contra Costa Counties (and Some Adjacent Areas). Third Edition. California Native Plant Society, East Bay Chapter.

Peak and Associates, Inc. 1987. Report on the Cultural Resources Assessment of the Proposed San Joaquin Valley Pipeline. Prepared for Ecology and Environment, Inc.

Petroleum Extension Service, University of Texas, Austin. 1984. Pipeline Construction Available Through University of Texas, Austin - Balcines Research Center.

Remy, M., T.A. Thomas, J.G. Moose, and W. Yeates. 1994. Guide to the California Environmental Quality Act (CEQA).

Royston Hanamoto Alley & Abey. 1992. Final Draft San Joaquin River Parkway Plan.

San Joaquin County Board of Supervisors. 1992. San Joaquin County General Plan 2010, Volumes I and II.

San Joaquin Valley Unified Air Pollution Control District. 1994. Construction Site Dust Mitigation Plan.

Steinhart, P. 1990. California's Wild Heritage, Threatened and Endangered Animals in the Golden State.

U.S. Congress. 1994. California Wilderness Status Map "Desert National Park" Legislation.

U.S. Department of the Interior. 1985. Record of Decision to the 1984 Plan Amendments of the California Desert Conservation Area Plan 1980.

____________. 1986. Final EIS - Proposed 1985 Plan Amendments to the California Desert Plan and Eastern San Diego County MFP.

____________. 1989. Plan Amendments to the California Desert Conservation Area Plan of 1980 - Decision Record.

U.S. Department of the Interior Bureau of Land Management (BLM). 1980. The California Desert Conservation Area Plan.

____________. 1984. 1983 Plan Amendments - The California Desert Area Plan of 1980 - Record of Decision.

____________. 1987. Record of Decision to the 1986 Plan Amendments to the California Desert Plan and Eastern San Diego County MFP.

____________. 1988. 1987 Plan Amendment to California Desert Plan - Record of Decision.

____________. 1992. Final EIS - Transcolorado Gas Transmission Project.

____________. 1993. 1989/1990 California Desert Conservation Area Plan Amendments Decision Record.

Woodward-Clyde Consultants (WCC). 1993a. Environmental Contamination Prescreening Overview. Prepared for Mojave Pipeline Company.

____________. 1993b. Biological Resources Survey Report, Mojave Northward Expansion Project. Prepared for Mojave Pipeline Company.

WPM Planning Team, Inc. 1993. Figure AP-1 South Manteca Draft Area Plan.

III. PERSONAL CONTACTS

Arroues, K.D., and B. Schmidt. 1994. Personal communication on June 8 between T. Colen (E & E) and K. Arroues and Schmidt (Soil Conservation Service, Kings County).

Battin, T., and D. Morrison. 1994. Personal communication on June 9 between L. Knorz and K. Johnson (E & E) and T. Battin (Tulare County Planning Department).

Baver, W.E. 1993b. Letter dated February 28 from W.E. Baver (Mojave Pipeline Operating Company) to G. Gordon (SLC).

Beach, R. 1994. Personal communication on June 8 between L. Knorz and K. Johnson (E & E) and R. Beach (City of Fresno).

Bekiaris, C. 1994. Letter dated July 18 from C. Bekaris (City of Pittsburg) to S. Lare (E & E).

Belluomini, J. 1994. Personal communication on June 29 between R. Walter (E & E) and J. Belluomini (Bakersfield Chamber of Commerce).

Berry, C. 1994. Personal communication on June 29 between R. Walter (E & E) and C. Berry (Visalia Chamber of Commerce).

Bonte, G. 1994a. Personal communications on June 10 and 15 between S. Lare (E & E) and G. Bonte (Redwood City Planning Division).

___________. 1994b. Letter dated June 15 from G. Bonte (Redwood City Planning Division) to S. Lare (E & E).

Brown, A. 1994. Personal communication on October 11 between L. Glasper (E & E) and A. Brown (Western Division, Naval Facilities Engineering Command, San Bruno).

Brown, E. 1994. Personal communication on November 3 between S. Lare (E & E) and E. Brown (City of Livermore Planning Department).

Brown, J. 1994. Personal communication on June 10 between P. Cook (E & E) and J. Brown (U.S. Department of Fish and Wildlife).

Brown, R., et al. 1994. Personal communication on June 10 between S. Lare (E & E) and E. Brown, J. Hines, and R. Brown (City of Livermore).

Buggher, D. 1994. Personal communication on June 29 between L. Knorz (E & E) and D. Buggher (City of Coalinga Planning Department).

Cantu, B. 1994. Personal communication on June 3 between L. Knorz (E & E) and B. Cantu (Manteca Development Services).

Carrington, D. 1994. Personal communication on October 18 between S. Lare (E & E) and D. Carrington (City of Dublin Planning Department).

Castle, J. 1994. Personal communication on October 11 between L. Glasper (E & E) and J. Castle (San Francisco Sun Reporter).

Chamiel, F. 1994. Personal communication on June 9 between L. Knorz (E & E) and F. Chamiel (Kern County Planning Department).

Chang, K. 1994. Personal communication on June 5 and 8 between T. Colen (E & E) and K. Chang (Soil Conservation Service, Fresno County).

Chapin, D. 1994. Personal communication on June 8 between L. Knorz and K. Johnson (E & E) and D. Chapin (Fresno County Planning Department).

Clemens, D. 1994. Personal communication on October 18 between S. Lare (E & E) and D. Clemens (City of Livermore Planning Department).

Conant, R. 1994. Written communication dated June 6 from R. Conant (City of Tracy) to L. Knorz (E & E).

Cope, B. 1994. Personal communication on June 7 between L. Knorz (E & E) and B. Cope (Merced County Planning Department).

Dahlem, D. 1994. Personal communication on June 30 between R. Walter (E & E) and D. Dahlem (City of Barstow).

Davids, T. 1994a. Personal communication on September 16 between L. Glasper (E & E) and T. Davids (Joint Powers Board/ San Mateo County Transit District).

____________. 1994b. Personal communication on September 20 between P. Geiger (E & E) and T. Davids (Joint Powers Board/San Mateo County Transit District).

Davis, S.E. 1994a. Letter dated August 1 from S.E. Davis (City of Antioch Director of Public Works) to D. Tanguay (E & E).

____________. 1994b. Personal communication on August 18 between D. Tanguay (E & E) and S. Davis (City of Antioch).

Diamond, A. 1994. Personal communication on August 1 between C. Colline (E & E) and A. Diamond (California Air Resources Board).

Emslie, S. 1994. Letter dated September 29 from S. Emslie (City of Leandro Planning Manager) to S. Lare (E & E).

Fenstermacher, J. 1994. Personal communication on October 25 between S. Lare (E & E) and J. Fenstermacher (Alameda County Public Works Department).

Gibbons, D. 1994. Written communication dated May 17 from D. Gibbons (Tri-Valley Associates) to Lois Cashell (FERC).

Goodfellow, G. 1994a. Personal communication on June 16 between S. Lare (E & E) and G. Goodfellow (City of Santa Clara).

____________. 1994b. Letter dated June 16 from G. Goodfellow (City of Santa Clara Director of Planning and Inspection) to S. Lare (E & E).

Gravel, J. 1994. Personal communication on October 17 between S. Lare (E & E) and J. Gravel (City of Pittsburg Planning Department).

Hall, J. 1994. Personal communication on October 12 between S. Lare (E & E) and J. Hall (California Department of Transportation).

Harbin, J. 1994. Personal communication on October 18 between S. Lare (E & E) and J. Harbin (City of Fremont Planning Department).

Harbin, J., et al. 1994. Personal communication between S. Lare and K. Ladd (E & E) and J. Harbin, R. Arimos, and R. Newman (City of Fremont).

Hardy, P. 1994. Personal communication on October 18 between S. Lare (E & E) and P. Hardy (City of San Ramon Planning Department).

Hendricks, D. 1994a. Personal communications on July 7 and 25 and August 7 between L. Knorz (E & E) and D. Hendricks (Madera County Planning Department).

__________. 1994b. Letter dated August 25 from D. Hendricks (Madera County Planning Department) to L. Knorz (E & E).

Hobbs, C. 1994. Personal communication on August 25 between D. Tanguay (E & E) and G. Hobbs (Lemoore Planning Department).

Hoffmeister, G. 1994. Personal communication on October 17 between S. Lare (E & E) and G. Hoffmeister (City of Concord Planning Department).

Horton, J. 1994. Personal communication on August 13 between P. Geiger (E & E) and J. Horton (California EPA Department of Toxic Substances Control).

Hussain, Y. 1994. Personal communication on October 17 between S. Lare (E & E) and Y. Hussain (City of Pleasant Hill Planning and Public Works Departments).

Jensen, B. 1994a. Personal communication on June 2 between S. Lare (E & E) and B. Jensen (Alameda County Planning Department).

__________. 1994b. Personal communication on June 17 between P. Geiger (E & E) and B. Jensen (Alameda County Planning Department).

Johnson, S. 1994. Personal communication on June 6 between S. Lare (E & E) and S. Johnson (Bureau of Land Management, Desert District).

Karrs, R. 1994. Personal communication on July 15 between C. Colline (E & E) and R. Karrs (San Joaquin Valley Unified Air Pollution Control District).

Kavanaugh, R. 1994. Written communication dated June 29 from R. Kavanaugh (California Employment Development Division) to R. Walter (E & E).

Khatami, M. 1994a. Personal communication on July 12 between L. Knorz (E & E) and M. Khatami (City of Atwater Senior Planner).

__________. 1994b. Letter dated August 12 from M. Khatami (City of Atwater Senior Planner) to L. Knorz (E & E).

Klemencic, M. 1994. Personal communication on June 6 between S. Lare (E & E) and M. Kleinencic (Santa Clara Valley Water District).

Koehler, D. 1994. Personal communication on June 10 between L. Knorz (E & E) and D. Koehler (San Joaquin River Parking and Construction).

Krobmacher, F. 1994. Personal communication between S. Lare (E & E) and F. Krobmacher (Town of Danville Planning Department).

Kutsuris, K. 1994. Personal communication on June 23 between P. Geiger (E & E) and K. Kutsuris (Contra Costa County Planning Department).

Ladd, J. 1994. Personal communication on July 5 between K. Johnson (E & E) and J. Ladd (State Water Resources Control Board, Sacramento).

LaFleur, A. 1994. Letter dated May 17 from A. LaFleur to L. Cashell (FERC).

Lindenmeyer, T. 1994a. Personal communication on June 9 between D. Tanguay (E & E) and T. Lindenmeyer (East Bay Regional Parks District).

____________. 1994b. Personal communications on June 9, 15, and 16 between K. Ladd (E & E) and T. H. Lindenmeyer (East Bay Regional Parks District).

Martin, N.J. 1994a. Personal communications on June 13 and 16 between S. Lare (E & E) and N. Martin (City of San Carlos).

____________. 1994b. Letter dated June 16 from N.J. Martin (City of San Carlos Planning Director) to S. Lare (E & E).

Martinez, S. 1994. Personal communication on June 29 between R. Walter (E & E) and S. Martinez (Needles Chamber of Commerce).

Maus, R.L. 1994a. Personal communication on August 23 between Sandy Lare (E & E) and R. Maus (City of Livingston).

____________. 1994b. Letter dated September 23 from R. L. Maus (City of Livingston Associate Planner) to L. Knorz (E & E).

McAdams, S. 1994. Personal communication on June 20 between K. Johnson (E & E) and S. McAdams (San Francisco Bay Conservation and Development Commission).

Mendez, L. 1994. Written communication dated May 20 from L. Mendez (San Francisco Bay Conservation and Development Commission) to L. Cashell (FERC).

Michaels, J. 1994. Personal and written communication received June 10 from J. Michaels (San Francisco Bay Conservation and Development Commission) to S. Lare (E & E).

Mitchell, D. 1994. Personal communication on July 20 between C. Colline (E & E) and D. Mitchell (San Joaquin Valley Unified Air Pollution Control District).

Mohan, S. 1994. Personal communications on August 9 and 14 between C. Colline (E & E) and S. Mohan (Arizona Department of Environmental Quality, Air Quality Section).

Monroe, M. 1994. Written communication dated June 13 from M. Monroe (City of Burlingame) to S. Lare (E & E).

Mojave Pipeline Operating Company. 1993. Letter dated February 28 from Mojave to S. Johnson (BLM).

Murray, W. 1994. Personal communication on October 26 between S. Lare (E & E) and W. Murray (San Joaquin County Public Works Department).

Myers, D. 1994a. Written communication dated July 7 from D. Meyers (Darwin Meyers and Associates) to S. Lare (E & E).

____________. 1994b. Personal communication on July 21 between L. Knorz (E & E) and D. Myers (Darwin Myers Associates).

Nelson, C. 1994a. Personal communication on August 25 between D. Tanguay (E & E) and C. Nelson (City of Brisbane Planning Department).

____________. 1994b. Personal communication on September 2 between S. Lare (E & E) and C. Nelson (City of Brisbane Planning Department).

O'Bannon, J. 1994. Personal communication on July 18 between C. Colline (E & E) and J. O'Bannon (San Joaquin Valley Unified Air Pollution Control District).

O'Leary, L. 1994. Personal communication between K. Johnson (E & E) and L. O'Leary (U.S. Army Corps of Engineers, Sacramento District).

Orcutt, B. 1994. Personal communication on June 20 between P. Cook (E & E) and B. Orcutt (California Department of Fish and Game).

Oster, K. 1994. Personal communication on June 8 between K. Ladd (E & E) and K. Oster (Soil Conservation Service, Paso Robles).

Pisila, D. 1994. Personal communication on June 10 between D. Tanguay (E & E) and D. Pisila (Contra Costa County Water District).

Price, G.A. 1994a. Personal communication on July 29 between S. Lare (E & E) and G. Price (City of Sunnyvale Planning Department).

____________. 1994b. Letter dated August 29 from G.A. Price (City of Sunnyvale Planning Department) to S. Lare (E & E).

Radcliff, M. 1994. Personal communication on October 11 between L. Glasper (E & E) and M. Radcliff (New Bayview Newspaper).

Raives, J. 1994. Personal communication on June 16 between P. Cook (E & E) and J. Raives (California Coastal Commission).

Raud, A. 1994. Personal communication on July 27 between S. Lare (E & E) and A. Raud (City of Oakland).

Regal J. 1994. Personal communication on June 9 between T. Colen (E & E) and J. Regal (Soil Conservation Service, Kern County).

Sahm, B. 1994a. Letter dated July 14 from B. Sahm (City and County of San Francisco Planning Department) to S. Lare (E & E).

______. 1994b. Written communication dated July 14 from B. Sahm (City and County of San Francisco) to C. Karpowicz (E & E).

Salinger, J. 1994. Personal communication on June 30 between D. Tanguay (E & E) and J. Salinger (U.S. Naval Weapons Station Concord).

Schindler, G. 1994. Personal communication on June 20 between L. Knorz (E & E) and G. Schindler (City of Hanford).

Scott, S. 1994. Written communication dated July 26 from S. Scott (City of San Mateo) to S. Lare (E & E).

Shearin, G. 1994. Personal communication on October 20 between S. Lare (E & E) and G. Shearin (DeLeuw, Cather, and Company).

Simon, C. 1994. Personal communication on October 17 between S. Lare (E & E) and C. Simon (City of Antioch Planning Department).

Simpson, D. 1994. Personal communication on June 3 between T. Colen (E & E) and D. Simpson (Soil Conservation Service, Stockton).

Smith, B. 1994. Personal communication on June 29 between L. Knorz (E & E) and B. Smith (City of Modesto Department of Planning).

Smith, C. 1994. Personal communication on June 29 between L. Knorz (E & E) and C. Smith (City of Madera).

Soenen, L. 1994. Personal communication on June 1 between K. Ladd (E & E) and L. Soenen (Soil Conservation Service, Contra Costa County).

Steinberger, J. 1994. Personal communication on July 21 between C. Colline (E & E) and J. Steinberger (Bay Area Air Quality Management District).

Stevens, T. 1994. Personal communication on June 3 between L. Knorz (E & E) and T. Stevens (Sacramento County Planning Department).

Sullivan, C. 1994. Personal communication on June 3 between L. Knorz (E & E) and C. Sullivan (San Joaquin County Planning Department).

Swift, B. 1994a. Personal communication on June 10 between S. Lare (E & E) and B. Swift (City of Pleasanton Planning Department).

______________. 1994b. Personal communication on October 18 between S. Lare (E & E) and B. Swift (City of Pleasanton Planning Department).

Tholen, G. 1994. Personal communication on July 20 between C. Colline (E & E) and G. Tholen (Sacramento Air Quality Management District).

Thommen, L. 1994. Written communication dated June 30 from L. Thommen (California Employment Development Division) to R. Walters (E & E).

Tomsovic, D. 1994. Written communication dated July 6 from D. Tomsovic (EPA) to Christian Colline (E & E).

Tomsovic, D., and B. Pallarino. 1994. Personal communication on July 29 between P. Geiger (E & E) and D. Tomsovic and B. Pallarino (EPA).

Tong, L. 1994. Personal communication on July 21 between S. Lare (E & E) and L. Tong (City of Dublin Planning Department).

Towers, R. 1994. Personal communication on June 7 between L. Knorz and K. Johnson (E & E) and R. Towers (Stanislaus County Planning).

Townsend, S. 1994. Personal communication on July 20 between L. Knorz (E & E) and S. Townsend (Lindsay Community Development Department).

Tsuda, R. 1994. Personal communication on June 21 between S. Lare (E & E) and R. Tsuda (Mountain View Office of Community Development).

Tunison, L. 1994. Personal communication on October 20 between S. Lare (E & E) and L. Tunison (Contra Costa County Public Works).

Urgarte, E. 1994. Personal communication on June 17 between S. Lare (E & E) and E. Urgarte (City of Belmont).

Vinson, E. 1994. Personal communication on June 2 between K. Ladd (E & E) and E. Vinson (Soil Conservation Service, Davis).

Wallace, D. 1994. Personal communication on October 17 between S. Lare (E & E) and D. Wallace (City of Walnut Creek Planning Department).

Zeller, B. 1994. Personal communication on July 22 between C. Colline (E & E) and B. Zeller (Mojave Desert Air Quality Management District).

Zumbach, H. 1994. Written communication dated May 15 from H. Zumbach (private citizen) to Lois Cashell (FERC).

Zumwalt, W. 1994. Personal communication on June 8 between L. Knorz and K. Johnson (E & E) and W. Zumwalt (Kings County Planning Agency).

APPENDIX F

LIST OF PREPARERS

Boyle, Michael J., FERC Project Manager
B.A., Environmental Sciences, 1978, University of Virginia

Griggs, Mary, SLC Project Manager
B.A., Economics, 1985, University of California at Davis

Montag, Rafael L., FERC Geologist
M.A., Geology, 1978, Queens College, City University of New York
B.A., Geology, 1972, Brooklyn College, City University of New York

Hertling, Mary M., FERC Geologist
M.A., Geology, 1977, Queens College, City University of New York
B.A., Geology, 1970, Queens College, City University of New York

Kopka, Robert J., FERC Soil Conservationist
M.S., Soil Science, 1990, Cornell University
B.S., Agronomy, 1978, Delaware Valley College

Jacobs, Diana, SLC Biologist
Ph.D., Wildland Resource Science, 1987, University of California at Berkeley
M.S., Wildland Resource Science, 1975, University of California at Berkeley
B.S., Biological Science, 1973, Stanford University

Olson, Amy K., FERC Wildlife Biologist
M.S. Candidate, Environmental Earth Sciences and Policy, Johns Hopkins University
B.A., Biology, 1992, Messiah College

Friedman, Paul, FERC Archeologist
M.A., History, 1980, University of California at Santa Barbara
B.A., Anthropology and History, 1976, University of California at Santa Barbara

Gallo, David M., FERC Physical Scientist
B.A., General Natural Sciences, 1976, University of Pittsburg

Thomas, Hugh V., FERC Mechanical Engineer
B.S., Mechanical Engineering, 1991, University of Maryland
B.S., Physical Science, 1990, Salisbury State University

Karpowicz, Cheryl A., AICP, E & E Project Manager
B.A., Interdepartmental Studies, 1973, University of Rochester

Geiger, Peter M., E & E Assistant Project Manager
M.S., Physics, 1988, Simon Fraser University
B.S., Physics, 1984, Xavier University

Elam, K. Sheryl, E & E Technical Editor
M.A., Biology, 1976, San Francisco State University
B.A., Zoology, 1971, University of California at Berkeley

Enkeboll, Robert H., R.G., E & E Geologist
M.S., Earth Science, 1978, University of California at Santa Cruz
B.S., Geological Sciences, 1975, University of Washington

Colen, Timothy M., E & E Geologist
M.S., Mining Engineering, 1989, Columbia University
B.S., Geology, 1979, University of California at Santa Cruz

Ladd, Karen, E & E Geologist
B.A., Geophysics, 1985, University of California at Berkeley

Lander, Bruce, Paleontologist
Ph.D., Paleontology, University of California at Berkeley
M.A., Paleontology, University of California at Berkeley
B.A., Geology, University of California at Los Angeles

Johnson, Karen, E & E Water Resources Specialist
M.S., Water Resources Management, 1987, University of Wisconsin at Madison
B.A., Environmental Studies/Geography, 1979, University of California at Santa Barbara

Moy, Colin S., REA, E & E Water Quality Specialist
M.S., Chemical Oceanography, 1980, Old Dominion University
B.S., Chemistry, 1977, University of Delaware

Cook, Patricia L., CHMM, E & E Biological Resources Specialist
B.S., Conservation of Natural Resources, 1980, University of California at Berkeley

Donnelly, Michael, E & E Biologist
M.E.M., Environmental Management, 1988, Duke University
B.S., Biology, 1987, Xavier University

Tanguay, Denise T., E & E Land Use/Socioeconomics Specialist
M.S., Resource Systems/Policy Design, 1984, Dartmouth College
B.A., Environmental Studies, 1982, Pomona College

Lare, Sandra J., E & E Land Use Specialist
B.A., Environmental Studies, 1990, State University of New York at Binghamton

Knorz, Linda M., E & E Land Use Specialist
B.A., Environmental Studies, 1991, University of New York at Buffalo
B.S., Business Administration, 1988, University of New York at Buffalo

Walter, Richard, E & E Environmental Economist
M.A., Energy, Environment, Science, and Technology, 1993, Johns Hopkins University
B.A., History, 1986, Stanford University

Peak, Melinda, Cultural Resources Specialist
M.A., History, California State University at Sacramento
B.A., Anthropology, University of California at Berkeley

Colline, Christian, CHMM, E & E Air Quality Specialist
M.S., Environmental Engineering, 1990, University of California at Berkeley
B.S., Chemical Engineering, 1986, University of California at Berkeley

Robinson, Cheryl A., E & E Safety Engineer
M.S., Nuclear Engineering, 1981, Oregon State University
B.S., Nuclear Engineering, 1978, Oregon State University

Linton, Deborah J., E & E Geographer/Graphic Artist
B.A., Geography, 1973, Wayne State University

Chadwick, Patricia, E & E Computer Specialist
B.A., Health Science, 1980, San Francisco State University

APPENDIX G

EIR/EIS DISTRIBUTION LIST

Federal Government Agencies

Advisory Council on Historic Pres.
Advisory Council on Historic Preservation
Army Corps of Engineers, DAEN-CWP-A
Bonneville Power Administration
Bureau of Indian Affairs
Center for Disease Control
Commission on Energy & Natural Gas
Council on Environmental Quality
Department of Commerce, Room 6117
Department of Energy (PE-25)
Department of Justice
Department of Labor
Department of State
Department of Transportation
Department of the Air Force
Department of the Navy - Western Division
Department of the Treasury
Environmental Management Office
Environmental Protection Agency
Farm Credit Administration
Federal Aviation Administration
Federal Energy Regulatory Commission
Federal Highway Administration
Grants Pol/Proc Branch, EPA PM-216
HUD-Director of Environment
Installations Division, NREA
Interstate Commerce Commission
MINERALS MANAGEMENT SERVICE
National Marine Fisheries
National Park Service
National Wildlife Federation
Naval Air Station
Office of Federal Activities A-109
Office of Finance & Management
Office of Intergov. Affairs--DOE
Office of Prog. Analysis & Eval.
Office of Program Initiatives
Secretary of Defense
Soil Conservation Service
U.S. Army Corps of Engineers
U.S. Bureau of Indian Affairs

U.S. Bureau of Land Management
U.S. Bureau of Reclamation
U.S. Coast Guard
U.S. DOT, Office of Pipeline Safety
U.S. Department of Agriculture
U.S. Department of the Air Force
U.S. Environmental Protection Agency
U.S. Fish & Wildlife Service
U.S. Forest Service
U.S. Geological Survey
U.S. Naval Weapons Station
U.S. Navy
US Bureau of Land Management
United States Department of Interior

Indians

Colorado River Tribal Council	AZ
Chemehuevi Tribal Council	CA
Fort Mojave Tribal Council	CA
Ione Band of Miwok Indians	CA
Miwok Indian Tribe	CA
Muwekma Tribe	CA
Ohlone Indian Tribe	CA
Panamint Shoshone	CA
Patwin Indian Tribe	CA
Timbi-Sha Band of Shoshone Indians	CA
Tuolumne Me-Wuk Rancheria	CA
Upper Lake Rancheria	CA
Yokut Indian Tribe	CA

Congressional Representatives

Senator Boatwright	CA
Representative Anna Eshoo	DC
Representative Bill Baker	DC
Representative Bob Stump	DC
Representative Calvin Dooley	DC
Representative Frank Riggs	DC
Representative Gary Condit	DC
Representative George Brown	DC
Representative George Miller	DC
Representative George Radanovich	DC
Representative Howard McKeon	DC
Representative Jay Kim	DC
Representative Jerry Lewis	DC
Representative Nancy Pelosi	DC
Representative Norman Maneta	DC
Representative Pete Stark	DC
Representative Richard Pombo	DC
Representative Robert Matsui	DC

Representative Ronald Dellums	DC
Representative Tom Lantos	DC
Representative Vic Fazio	DC
Representative Wally Herges	DC
Representative William Thomas	DC
Representative Zoe Lofgren	DC
Senator Barbara Boxer	DC
Senator Diane Feinstein	DC
Senator Joh Kyl	DC
Senator John McCain	DC

State Government Agencies

CA STATE COASTAL CONSERVANCY	AK
AZ Dept. of Health Service	AZ
AZ Dept. of Transportation	AZ
AZ Dept. of Water Resources	AZ
AZ Mineral Resources Dept.	AZ
AZ Office of Economic Planning	AZ
AZ State Lands Comm.	AZ
Arizona Corporation Commission	AZ
Arizona Department of Environmental Quality	AZ
Arizona Dept of Environmental Quality	AZ
Arizona Dept. of Agriculture	AZ
Arizona Game and Fish Department	AZ
Arizona State Clearinghouse	AZ
Governor of Arizona	AZ
SHPO AZ State Parks	AZ
CA AIR RESOURCES BOARD	CA
CA Air Resources Board	CA
CA Assembly Comm. on Natural Resources	CA
CA DEPARTMENT OF HEALTH	CA
CA DEPT OF BOATING & WATERWAYS	CA
CA DEPT OF CONSERVATION	CA
CA DEPT OF PARKS & RECREATION	CA
CA DEPT OF WATER RESOURCES	CA
CA Department of Conservation	CA
CA Department of Fish & Game	CA
CA Dept. of Conservation	CA
CA Dept. of Food & Agriculture	CA
CA Dept. of Parks & Rec.	CA
CA Div. of Mines and Geology	CA
CA Div. of Water Quality	CA
CA OFFICE OF HISTORIC PRESERVATION	CA
CA PUBLIC UTILITIES COMMISSION	CA
CA Public Utilities Commission	CA
CA RECLAMATION BOARD	CA
CA Reg. Water Qual. Control Board	CA
CA Resources Agency	CA
CA Senate	CA

CA Senate Office of Research	CA
CA WASTE MANAGEMENT BOARD	CA
CA WATER RES CONTROL BOARD	CA
CALIFONRIA HIGHWAY PATROL	CA
CALIFORNIA COASTAL COMMISSION	CA
CALIFORNIA ENERGY COMMISSION	CA
CALTRANS	CA
CALTRANS DISTRICT 3	CA
CALTRANS PLANNING	CA
CALTRANS DISTRICT 4	CA
CALTRANS DISTRICT 6	CA
California Air Resources Board	CA
California Dept. of Forestry	CA
California Dept. of Water Resources	CA
California Energy Commission	CA
California Farm Bureau Federation	CA
California Legislature - Assembly	CA
California Public Utilities Commission	CA
Caltrans	CA
Caltrans District 3	CA
Caltrans District 4	CA
Caltrans-District 8	CA
Caltrans-Planning	CA
Environmental Section	CA
Governor of California	CA
Native American Heritage Comm.	CA
Office of Historic Preservation	CA
Office of Special Projects	CA
REG WATER QUAL CONTROL BOARD	CA
SF BAY CONS & DEV COMM	CA
SF Bay Regional Water Quality Control Board	CA
San Francisco Bay Conservation & Develop.	CA
State Lands Commission	CA
State of California	CA

County Government Agencies

Mohave County	AZ
Alameda County Administrator	CA
Contra Costa County	CA
Contra Costa County Flood Control	CA
County of Alameda	CA
County of Fresno	CA
County of Sacramento	CA
County of San Mateo	CA
County of Santa Clara	CA
Kern County	CA
Kern County APCD	CA
Kern County Board of Supervisors	CA
Kings County	CA

Kings County Planning Agency	CA
Madera County	CA
Madera County Planning Department	CA
Merced County	CA
San Bernardino County	CA
San Bernardino County Administrator	CA
San Bernardino County Planning Commission	CA
San Joaquin County Administrator	CA
San Mateo County Transportation District	CA
Santa Clara County Executive	CA
Santa Clara County Parks	CA
Stanislaus County	CA
Tulare County Executive	CA
Tulare County Planning Department	CA

Local Government Agencies

City of Kingman	AZ
Bay Area Air Quality Management District	CA
Belmont Community Development Department	CA
City Hall	CA
City of Alameda	CA
City of Antioch	CA
City of Atwater	CA
City of Bakersfield	CA
City of Belmont	CA
City of Brisbane	CA
City of Brisbane - Planning Director	CA
City of Ceres	CA
City of Chowchilla	CA
City of Coalinga	CA
City of Concord	CA
City of Delano	CA
City of Dinuba	CA
City of Dublin	CA
City of Exeter	CA
City of Fowler	CA
City of Fremont	CA
City of Fresno Planning Department	CA
City of Galt	CA
City of Hanford	CA
City of Hayward	CA
City of Huron	CA
City of Kingsburg	CA
City of Lathrop	CA
City of Lemoore	CA
City of Lindsay	CA
City of Livermore	CA
City of Livingston	CA
City of Los Altos	CA

City of Manteca	CA
City of Martinez	CA
City of McFarland	CA
City of Menlo Park	CA
City of Menlo Park - Engineering Division	CA
City of Merced	CA
City of Millbrae	CA
City of Milpitas	CA
City of Modesto	CA
City of Mountain View	CA
City of Newark	CA
City of Oakland	CA
City of Palo Alto	CA
City of Pittsburg	CA
City of Pleasanton	CA
City of Porterville	CA
City of Redwood City	CA
City of Ripon	CA
City of San Bruno	CA
City of San Carlos	CA
City of San Francisco	CA
City of San Leandro	CA
City of San Ramon	CA
City of Sanger	CA
City of Santa Clara	CA
City of Selma	CA
City of Stockton	CA
City of Suisun City	CA
City of Sunnyvale	CA
City of Tracy	CA
City of Tulare	CA
City of Turlock	CA
City of Visalia	CA
Community Development - Lemoore	CA
Contra Costa Water District	CA
Daggett Community Serv. Dist.	CA
Kingsburg City Planning Dept	CA
Livermore Valley Joint Unified School Dist	CA
Los Angeles Department of Water & Power	CA
Menlo Park Fire Protection District	CA
Metropolitan Water Dist. of S. California	CA
Mojave Desert Air Quality Management Dist.	CA
Office of the Mayor	CA
Redwood City Hall, Planning Division	CA
SAN BERNARDINO CO., PLANNING DEPT.	CA
Sacramento Metro Air Quality Mgmt District	CA
San Francisco Water Department	CA
San Joaquin Valley Unified Air Pollution	CA
Santa Clara Valley Water District	CA
Stanford University	CA

Town of Atherton	CA
Town of Hillborough	CA
West Bay Sanitary District	CA

Libraries

Mohave Community College Library	AZ
Mohave County Library	AZ
ANGELO M. IACOBONI PUB. LIBRARY	CA
Alameda County Library	CA
Alameda Free Library	CA
BRIGGEMEYER MEMORIAL LIBRARY	CA
California State Library	CA
Coalinga-Huron Library	CA
Contra Costa County Library	CA
Fresno County Library	CA
Kern County Library	CA
Kings County Library	CA
LUCERNE VALLEY LIBRARY	CA
Library - Govt. Publications	CA
Livermore Public Library	CA
Madera County Library	CA
Merced County Library	CA
Mountain View Public Library	CA
Oakland Public Library	CA
Palo Alto City Library	CA
Redwood City Public Library	CA
Sacramento Public Library	CA
San Bernardino County Library	CA
San Francisco City & County Library	CA
San Francisco Public Library	CA
San Jose Public Library	CA
San Leandro Community Library	CA
San Mateo County Library	CA
Santa Clara Public Library	CA
Stanislaus County Library	CA
Stockton Public Library	CA
Sunnyvale Public Library	CA
Tulare County Library	CA
Tulare Public Library	CA
U. of Redlands Armacost Library	CA
U.S. GEOLOGICAL SURVEY LIBRARY	CA
West Hills Commu. College Library	CA
BLM LIBRARY, SC-324A, Bldg. 50	CO
LIBRARY OF CONGRESS, UNIT X	DC

Media

Milpitas Post	CA

Organizations & Individuals

George Smith	
Southern Natural Gas Company	AL
Arizona Wildlife Foundation	AZ
Rijlaarsdam Dairy	AZ
Ruth M. Henderson	AZ
A.D. Seeno Construction Co.	CA
Adams & Broadwell	CA
Alameda County Water District	CA
Albert Dewinkle	CA
Anne C. Angelakis, Life Estate	CA
Anne Dailey	CA
Anthony G. Piumatti, et al	CA
Anthony P. Cardoza, et. al.	CA
Archie Pessin	CA
Armine Gendron, et. al.	CA
Armour, Goodin, Schlotz & MacBride	CA
Attorney at Law	CA
Barbara Ostrander	CA
Barry Brunelle	CA
Beal Properties Inc.	CA
Bee Removers	CA
Bert H. Brendle, et. al.	CA
Bertram S. Christensen, et. al.	CA
Bill R. Langford, et. al.	CA
Blake Heitzman	CA
Blocklite	CA
Bold, Polisner, Maddow, Nelson & Judson	CA
Bruna Farnesi, et. al.	CA
Burt Christian	CA
C.F. Crohare	CA
C/O Timothy A. Weaver, C.P.A.	CA
CA Association of 4WD Clubs	CA
CA Fed of Mineralogical Societies	CA
CCA	CA
CORVA	CA
California Cattlemen's Association	CA
California Native Plant Society	CA
Campisi Trust	CA
Catherine Rudich, Trustee	CA
Central Contra Costa Sanitary District	CA
Century Plaza Corporation	CA
Charles Mondavi & Sons, Inc.	CA
Chin-Hsing Su	CA
Clem W. Morehead, Jr.	CA
D.L. Wood	CA
Daggett C.S.D.	CA
Daniel Garcia, et. al.	CA
Daniel W. Ensele, et. al.	CA

David	CA
David Gibbons	CA
David K. Bogard	CA
Delbert Heckenial	CA
Denis St. Jean	CA
Department Biological Science	CA
Derriel D. Hayes	CA
Dolores J. Cornwell	CA
Don Crawford, et. al.	CA
Don Fantz	CA
Donald J. Monseth	CA
Douglas Tuck	CA
Dwight F. Jordan	CA
EXAR Corporation	CA
East Bay Chapter CNPS	CA
East Bay Regional Parks	CA
Eb Bottimore, et al	CA
Ed Waldheim Corua	CA
Edna Hunt	CA
Ellman, Burke, Hoffman & Johnson	CA
Empire Ranch, Incorporated	CA
Eric P. Wente	CA
Estate - Harriet Surbrugg (Rein H. Everett)	CA
Franklin Secara, et. al.	CA
Gabriel Moitoso, TRS, et. al	CA
Gary D. Olson Farms	CA
Gary Doug Zimmerman	CA
George G. Becker	CA
George L. Meier	CA
George Walker, TR, et. al.	CA
Gordon H. Strider	CA
Gustavo Jiminez	CA
H & P Land Company	CA
H. De Jong Orchards	CA
HHE Farms, Inc.	CA
HIGH DESERT MULTIPLE-USE COALITION	CA
Henry Mitchell, et. al.	CA
Ina A. Petokas	CA
Jack H. Estes	CA
Jack McKissack	CA
Jack Tone Ranch	CA
Jake/Don Meeuwse, TRS, et.al.	CA
James S. Davis, et. al.	CA
Janet Armantrout	CA
Jeff Beason	CA
Jerry L. Moore	CA
Jim Bishop	CA
Joe McCarthy	CA
John A. Huegel	CA
John Black	CA

John M. & Margaret E. Toth, TRS, et. al.	CA
John McKeon	CA
John Mulrooney	CA
John Weststeyn, TRS, et.al.	CA
Joseph J. Gilbeau	CA
Judi L. Carlson	CA
Judith E. Pond	CA
Julie Marengo	CA
Keith Andrew	CA
Ken Lord	CA
Kiyoshi Yamamoto	CA
Kolb Ranch	CA
Laurie J. Albert	CA
Lawton Powers	CA
Leonard Logoluso, et. al.	CA
Leslie Eastburg, TRS, et.al.	CA
Lighthouse Pentecostal Holiness Church	CA
Linder Equipment Company	CA
Livermore Area Recreation & Park District	CA
Louis Chavez	CA
Louise M. Favorito	CA
Lucille Twiford	CA
Luther C. Johnson, TR	CA
Lynne Ashcraft	CA
Machado Ranch	CA
Maria De Pedrini	CA
Maria T. Tone	CA
Marie Ralph, TR, et. al.	CA
Marko Zaninovich Inc.	CA
Marko Zaninovich, Inc.	CA
Merle J. Mohler	CA
Mike Kenefick, et al	CA
Milton J. Lemos, TR	CA
Modesto Irrigation District	CA
Mojave	CA
Moore Consulting for S.H. Cowell Foundation	CA
Morris Hamblin, et. al.	CA
Morris F. Collier, et. al.	CA
Morrison Homes, Division of George Wipupry	CA
Mrs. Rowena Rouppet	CA
Mulqueeney Ranch	CA
NAS Lemoore	CA
Neil Ostrander	CA
Nick Yost	CA
Ninoos Daniel	CA
O.K. Doyle Co.	CA
Olivina Ranch	CA
Oversee Associates	CA
PLEUSS-STAUFFER (CA), INC.	CA
Pacific Gas & Electric	CA

Pacific Gas Transmission	CA
Patricia A. Thomas, et. al.	CA
Philip E. Reynolds	CA
Pirus Abraham, Jr., et. al	CA
Pleasanton, City of	CA
RMC Lonestar	CA
Randolph Savig	CA
Richard V. Bennett, et. al.	CA
Rick Carter	CA
Rick Corbett	CA
Robert Brown	CA
Robert Da Silva	CA
Robert L. King	CA
Robert Linder	CA
Robert Ward	CA
Roland Codiga	CA
Roman Catholic Bishop	CA
Ronald Silva, et. al.	CA
Ronald E. Miller, et. al.	CA
Ruddy Corporation	CA
S & M Ranch	CA
SO CALIF GAS COMPANY	CA
SOUTHERN CALIF EDISON CO	CA
San Bernardino County Museum	CA
San Diego Gas & Electric Company	CA
Sandra Kohler Knapp	CA
Santa Fe Energy Resources, Inc.	CA
Sevo E. Life Estate	CA
Sierra Club	CA
Sierra Club Legal Defense Fund	CA
Sierra Club Merced Group, Tehipite Chapter	CA
Siskin Ranchos	CA
Smoot Cattle Ranch	CA
Southern California Gas Company	CA
Stanislaus County, Chief Executive Office	CA
Stanley G. Barros, et. al.	CA
Stephen Boll	CA
Stephen L. Solari Inc., et al	CA
Strickler Family Par	CA
Susan L. Huang, Trustee	CA
Teamsters 386	CA
The Grupe Company	CA
The Presley Companies	CA
Thomas C. Hingsbergen	CA
Thon Lian Lan, et. al.	CA
Tod C. Judkins, et. al.	CA
Tom Markarian	CA
Tom Tinxsley	CA
Tony M. Cardoza, et. al.	CA
Tony P. Cardoza, et. al.	CA

Tosco Refining Company	CA
Tri-Valley Associates	CA
Unocal	CA
Van Elderen Trust	CA
Vector Environmental	CA
Virgil Anderson, et. al.	CA
W. David Etchason, et. al.	CA
W.C. Linder	CA
Wayne A. Nolan	CA
Wayne Blevins	CA
Wente Brothers Inc.	CA
Wente Land & Cattle	CA
William A. Henderson, et. al.	CA
Woodward-Clyde Consultants	CA
Wright & Talisman	CA
Zumbach Ranch	CA
PIC Technologies, Inc.	CO
Duncan, Weinberg, Miller & Pembroke, P.C.	DC
Dat Minh Le	FL
E.M. Loyless	FL
Mario Hidalgo, et. al.	HI
Stanley W. Estes, et. al.	IL
George Corey	MN
Earth First!	MT
Winston Johnson	NM
Setton International Foods, Inc.	NY
Enid & Sterling P. Madding	OR
Alan Parolini	TX
Delores Gilliam Thedford	TX
Earl Monteith	TX
Enviroclean Cogen Corp.	TX
G.W. Bush	TX
Greenville Corp.	TX
Greg Odegard	TX
Kern River Gas Transmission Company	TX
Tenneco West, Inc.	TX
Vernon L. Greggerson	TX
Raymond Zuidervaart, Jr., et	VA
STAR	VA

APPENDIX H

SUBJECT INDEX

Abandonment 2-26, 5-56, 5-61, 5-68, 5-69
Access roads 2-23, 4-109,5-59, 5-92, 5-104, 5-118, 6-2, 7-4, 7-13
Advisory Council on Historic Preservation (ACHP) 1-6, 5-114, 5-115
Alameda County 3-35, 3-38, 3-43, 3-46, 4-43, 4-61, 4-84, 4-121, 5-30, 5-94, 5-146, 5-147, 6-1, 7-38
Alameda County Water Supply District 5-96
Alameda Creek 4-43, 4-71
Alameda whipsnake 4-83, 5-71, 7-11, 7-34, 7-35
Alkali lowlands 4-55, 4-61, 4-69, 4-84, 5-41, 5-51
Amboy Compressor Station 4-21, 4-41, 4-109, 4-142, 5-127, 5-132
Antioch Dunes evening primrose 4-84, 5-75, 7-36
Antioch/Railroad Route Variation 3-55
Antioch/Wilbur Avenue Route Variation 3-55
Aquifers 4-32, 4-37, 4-38, 5-20, 5-21, 5-22, 5-26
Arizona Department of Environmental Quality (ADEQ) 4-134, 4-140, 5-125 4-134
Bakersfield 1-1, 2-1, 2-6, 2-18, 2-23, 2-24, 3-32, 4-61, 4-57, 4-77, 4-79, 4-121, 4-122, 4-135, 4-142, 5-111, 5-113, 5-139, 7-42
Bakersfield cactus 4-81, 5-55, 5-67
Barstow 1-7, 1-8, 4-32, 4-121, 5-111
Bay Area 1-1, 1-12, 2-6, 3-35, 3-36, 3-41, 3-46, 4-59, 4-60, 4-62, 4-63, 4-32, 4-37, 4-42, 4-43, 4-52, 4-58, 4-61, 4-68, 4-69, 4-78, 4-81, 4-82, 4-83, 4-100, 4-103, 4-109, 4-121, 4-122, 4-126, 4-129, 5-8, 5-17, 5-29, 5-40, 5-41, 5-50, 5-68, 5-96, 5-107, 5-110, 5-119, 5-120, 5-125, 6-1, 7-2, 7-3
Bay Area Air Quality Management District 4-134
Bay Conservation and Development Commission (BCDC) 5-29, 7-9
Bay Meadows Racetrack 5-104
Belmont 5-96, 5-97, 5-130, 7-38
Black Diamond Mines Regional Preserve 3-38, 4-108, 5-102, 5-107
Bureau of Land Management (BLM), *See* U.S. Bureau of Land Management 1-5, 1-8, 3-32, 3-35, 4-75, 4-76, 4-100, 4-108, 4-109, 4-125, 4-129, 5-51, 5-54, 5-56, 5-58, 5-98, 5-114, 5-115, 7-7, 7-10, 7-13, 7-27
Blunt-nosed leopard lizard 4-78, 5-36, 5-62, 5-63, 5-71, 7-11, 7-30, 7-31
Brittlescale 4-79, 4-85, 5-66, 5-67, 5-74, 7-32, 7-36
Brushy Peak Regional Park 5-102
Burlingame 5-97, 5-115
Burrowing owl 4-67, 4-75, 4-76, 4-77, 4-78, 4-81, 4-82, 5-56, 7-28
California Aqueduct 4-41, 4-42, 4-79, 5-18, 5-28, 7-21
California Department of Fish and Game (DFG) 1-6, 1-7, 1-12, 2-22, 4-55, 4-75, 5-23, 5-37, 5-39, 5-41, 5-50, 5-51, 5-52, 5-54, 5-55, 5-58, 5-60, 5-61, 5-62, 5-68, 5-69, 5-71, 5-72, 7-1, 7-9, 7-10, 7-11, 7-12, 7-26, 7-27, 7-28, 7-33, 7-35
California Desert Conservation Area (CDCA) 4-100, 5-98, 5-101
California Desert Protection Act 3-32, 4-103, 5-98, 5-101
California Endangered Species Act (CESA) 1-6, 5-54
California Energy Commission (CEC) 1-3, 3-26

California Environmental Quality Act (CEQA) 1-5, 1-6, 1-7, 1-11, 4-63, 4-75, 4-140, 5-102, 5-119, 5-120, 5-123, 5-124, 5-125, 7-3
California Native Plant Society (CNPS) 4-75, 4-79, 5-52, 5-66, 7-11
California Public Utilities Commission (CPUC) 1-3, 3-31, 3-32, 3-35
California Reclamation Board (CRB) 5-23, 5-26
California red-legged frog 4-83, 5-73, 7-33
California State Fire Marshall (CSFM) 5-134, 5-136
California State Historic Preservation Office (SHPO) 4-125, 4-126, 4-129, 5-115, 5-118, 7-1, 7-13
California State Water Resources Control Board (CSWRCB) 4-38, 5-25, 7-21
California tiger salamander 4-68, 4-83, 5-72, 7-11, 7-33
CalTrans 5-71, 5-95, 6-2, 7-35, 7-38
Candlestick Park 5-104, 7-13
Candlestick Point State Recreation Area 5-104
Central Valley 1-12, 3-32, 3-35, 3-46, 4-59, 4-60, 4-61, 4-62, 4-63, 4-17, 4-21, 4-32, 4-41, 4-42, 4-52, 4-56, 4-57, 4-58, 4-61, 4-67, 4-68, 4-69, 4-76, 4-78, 4-79, 4-81, 4-82, 4-83, 4-100, 4-103, 4-109, 4-121, 4-122, 4-125, 5-7, 5-14, 5-17, 5-28, 5-35, 5-36, 5-37, 5-40, 5-41, 5-48, 5-49, 5-59, 5-68, 5-74, 5-91, 5-106, 5-110, 6-1, 7-36
Clean Air Act 1-4, 4-134, 4-140, 5-128
Clean Water Act 2-22, 5-23, 5-25, 7-21
Concord Naval Weapons Station (CNWS) 3-38
Contra Costa County 2-23, 3-35, 3-38, 4-37, 4-61, 4-79, 4-82, 4-84, 4-109, 4-121, 5-30, 5-92, 5-102, 5-145, 5-146, 5-147,, 6-1
Contra Costa wallflower 4-85, 5-75, 7-36
Contra Costa Water District (CCWD) 1-9, 3-35, 3-36, 4-100, 4-108, 5-92, 5-102
Contra Loma Regional Park 3-36, 5-102, 5-103, 5-107, 6-2, 7-13
Cottonwood Creek 4-109
Coyote Creek 4-71, 5-51, 7-10
Daggett Compressor Station 4-21, 4-32, 4-142, 5-127, 5-128, 5-132
Delta-Mendota Canal 4-42, 5-118
Department of Fish and Game (DFG), *See* California Department of Fish and Game
Department of Toxic Substances Control (DTSC) 5-143, 5-144, 7-13, 7-43
Desert tortoise 4-76, 5-34, 5-48, 5-55, 5-56, 5-58, 7-10, 7-27
Double-crested cormorant 4-82, 5-69, 7-35
Dublin 3-40, 3-41, 5-96, 5-108, 5-115, 5-145, 7-38
East Bay Regional Park District (EBRPD) 3-36, 4-108, 5-102, 5-103, 5-104, 5-107
Eminent domain 5-91
Endangered Species Act of 1973 1-6, 5-33, 5-54
Environmental inspectors 2-15, 5-15, 7-5, 7-6, 7-14, 7-18
Environmental Protection Agency (EPA), *See* U.S. Environamental Protection Agency
Famoso Compressor Station 4-22, 4-41, 4-142, 5-60, 5-108, 5-128, 5-129, 5-132
Federal Emergency Management Agency (FEMA) 4-41
Federal Energy Policy Act of 1992 1-3
Federal Land Management Agency 5-17, 7-7
Federal lands 1-5, 4-75, 5-18, 5-114, 7-7, 7-8
Foxtail cactus 4-76, 5-59, 7-28
Fremont 1-1, 2-6, 3-36, 3-43, 4-59, 4-60, 4-62, 4-63, 4-38, 4-42, 4-43, 4-103, 5-9, 5-29, 5-30, 5-92, 5-94, 5-95, 5-96, 7-38

Fremont/Auto Mall Parkway Route Variation 3-55
Fremont/Southside Railroad Route Variation 3-55
Fresno 1-7, 1-8, 3-32, 4-33, 4-37, 4-41, 4-42, 4-77, 4-79, 4-81, 4-97, 4-108, 4-121, 4-122, 4-135, 5-23, 5-26, 5-111, 5-147
Fresno Bypass 3-35
Friant-Kern Canal 4-41, 5-118
Giant garter snake 4-71, 4-78, 5-63, 5-64, 5-72, 7-31
Golden eagle 4-66, 4-69, 4-82, 5-68, 5-69, 7-11, 7-35
Guadalupe River 4-43, 4-71
Heartscale 4-84, 5-74, 7-36
Hetch-Hetchy Aqueduct 4-42
Hoover's wooly star 4-79, 5-66, 7-32
Hydrostatic testing 2-19, 5-20, 5-22, 5-23, 5-25
Interstate 680 Corridor Northward Alternative Route 3-38
Interstate 680 Corridor Southward Alternative Route 3-43, 6-2
Kern County 2-1, 4-63, 4-75, 4-76, 4-77, 4-79, 4-81, 4-129, 5-6, 5-49
Kern River Gas Transmission Company 2-1
Kings River 4-37, 4-41
Large-flowered fiddleneck 4-84, 5-74, 7-36
Lemoore Naval Air Station 5-108, 5-129, 5-133
Lindsay Compressor Station 4-59, 4-21, 4-142, 5-108, 5-129, 5-133, 7-13
Livermore 1-7, 1-8, 1-9, 3-41, 3-51, 4-37, 4-38, 4-84, 5-41, 5-94, 5-96, 5-108, 5-145, 5-146
Livermore Area Recreation and Park District (LARPD) 3-36, 4-108, 5-129, 5-133
Livermore-Oakland Railroad Right-of-Way Westward Alternative Route 3-43
Livermore/Railroad Route Variation 3-46
Longhorn fairy shrimp 4-83, 4-84, 5-74, 7-29
Los Vaqueros Reservoir 1-9, 3-35, 4-100, 4-108, 5-102, 5-146, 5-147, 5-148, 6-1
Main Canal 3-38, 4-42
Meter stations 1-1, 1-12, 2-1, 2-6, 2-11, 2-15, 2-22, 2-26, 3-26, 4-43, 4-103, 5-18, 5-26, 5-60, 5-98, 5-105, 5-109, 5-139, 7-39, 7-42
Mission Peak Regional Preserve 4-109, 5-103
Mojave Desert Air Quality Management District 4-134
Mojave eriophyllum 4-76, 5-59
Mojave ground squirrel 4-66, 4-75, 5-55, 7-27, 7-28
Mokelumne Aqueduct 3-38, 3-40, 4-41
Mokelumne River 4-42
Mountain View 4-108, 5-95, 5-147, 7-38
National Environmental Policy Act (NEPA) 1-4, 1-5, 1-6, 1-7, 5-102
National Historic Preservation Act 1-6, 5-114, 5-118, 7-13
National Register of Historic Places 1-6, 5-102, 5-114, 5-115, 5-118
Natural Gas Act 1-1, 1-3, 1-4, 1-11, 2-26, 5-91
Needles 4-121, 5-111
Nonjurisdictional facilities 1-7, 1-11, 2-11
Northeast Pleasanton Route Variation 3-51
Occupational Safety and Health Administration (OSHA) 2-18
Office of Pipeline Regulation (OPR) 1-5, 2-22, 5-2, 5-10, 5-17, 5-28, 5-52, 5-90, 5-91, 5-118, 7-1, 7-4, 7-5, 7-6, 7-7, 7-8, 7-11, 7-12, 7-13
Offroad vehicles 5-101

Pacific Gas and Electric Company (PG&E) 1-3, 1-4, 1-8, 3-31, 3-32, 3-35, 5-145
Palmate-bracted bird's beak 4-84, 5-74, 7-36
Pipe storage yards 7-4
Pittsburg 3-38, 4-18, 5-92, 5-146
Pleasanton 3-36, 3-38, 3-43, 5-96, 5-145, 5-146
Pleasanton/Ridge Route Variation 3-51
Public water supplies 5-28
Recurved larkspur 4-79, 5-66, 5-67, 7-32
Redwood City 5-96, 5-97, 7-38
Riparian areas 4-55, 4-57, 4-77, 5-24, 5-31, 5-32, 5-34, 5-36, 5-37, 5-45, 5-46, 5-49, 7-9, 7-21, 7-23, 7-25
Roeding Park 5-101
Regional Water Quality Control Board (RWQCB) 4-42, 4-43, 5-23, 5-25, 5-30, 7-20, 7-21, 7-22
Sacramento Metropolitan Air Quality Management District 4-134
Salt marsh harvest mouse 4-71, 5-51
San Bernardino County 4-75, 4-76, 4-121, 4-134, 4-135, 5-9, 5-113, 5-147
San Carlos 3-51, 5-96, 5-97, 5-115, 7-38
San Carlos/Railroad Route Variation 3-51
San Francisco 1-1, 1-8, 2-1, 2-6, 2-11, 3-35, 3-36, 3-41, 3-46, 4-59, 4-60, 4-62, 4-63, 4-17, 4-18, 4-32, 4-37, 4-38, 4-42, 4-43, 4-52, 4-58, 4-61, 4-68, 4-69, 4-71, 4-78, 4-81, 4-82, 4-97, 4-100, 4-103, 4-108, 4-109, 4-121, 4-122, 4-125, 4-126, 4-129, 4-134, 4-139, 5-6, 5-8, 5-9, 5-17, 5-29, 5-40, 5-41, 5-50, 5-68, 5-97, 5-104, 5-107, 5-110, 5-120, 5-145, 5-147, 6-1, 7-2
San Francisco garter snake 4-83, 5-71, 7-11, 7-35
San Joaquin kit fox 4-67, 4-76, 4-81, 4-100, 5-49, 5-59, 5-60, 5-61, 5-62, 5-63, 5-68, 6-1, 7-11, 7-29, 7-30
San Joaquin River 2-12, 4-60, 4-32, 4-41, 4-42, 4-68, 4-77, 4-82, 4-84, 4-85, 4-108, 5-8, 5-26
San Joaquin River Parkway 5-101
San Joaquin Valley Pipeline Alternative Route 3-38
San Joaquin Valley Pipeline Northward Alternative Route 3-41, 6-2
San Joaquin Valley Unified Air Pollution Control District 4-134
San Jose 4-121, 5-51, 5-95
San Mateo 4-83, 4-97, 4-121, 5-6, 5-9, 5-97, 5-104, 5-146, 5-147, 7-38
Santa Clara County 3-41, 4-38, 4-121, 5-95
Santa Clara/Railroad Route Variation 3-55
Santa Cruz tarplant 4-84, 5-74, 7-36
Soil Conservation Service (SCS) 5-17
Shadow Cliffs Regional Recreation Area 5-104
Short-nosed kangaroo rat 4-77, 5-60, 5-61, 7-30
South Livermore/Aqueduct Route Variation 3-51
Spill Prevention, Control, and Control Plan (SPCC) 5-21, 5-26, 7-9, 7-19, 7-42
Spiny-sepaled button celery 4-81, 5-68, 7-36
Stanford University 5-103, 5-104, 7-13, 7-40
State Historic Preservation Office 4-125
Stockton 2-11, 4-135, 5-113
Storm Water Pollution Prevention Plan (SWPP) 5-25, 7-21
Suisun song sparrow 4-71, 4-82, 5-69, 5-70, 7-35

Sunol Regional Wilderness 4-109, 5-103, 5-108
Swainson's hawk 4-67, 4-77, 5-61, 5-62, 7-10, 7-28
Sycamore Grove Park 5-103, 5-108
Tipton kangaroo rat 4-77, 5-36, 5-60, 5-61, 7-30
Topock Compressor Station 2-1, 2-15, 2-25, 4-59, 4-22, 4-100, 4-134, 4-139, 4-142, 5-98, 5-108, 5-111, 5-125, 5-127, 5-130, 5-132
Tri-Valley/Greenville Road Route Variation 3-46, 3-51
Tulare 3-32, 4-32, 4-37, 4-41, 4-68, 4-76, 4-77, 4-81, 4-97, 5-61, 5-111, 5-113, 7-30
Tulare County 4-63, 4-79, 4-83, 4-121, 5-6
Tuolumne River 4-42
U.S. Army Corps of Engineers (USACE) 2-22, 4-52, 4-57, 5-23, 5-26, 5-28, 5-33, 5-39, 7-8, 7-10, 7-23
U.S. Bureau of Land Management (BLM) 1-5, 1-8, 3-32, 3-35, 4-75, 4-76, 4-100, 4-108, 4-109, 4-125, 4-129, 5-51, 5-54, 5-56, 5-58, 5-98, 5-114, 5-115, 7-7, 7-10, 7-13, 7-27
U.S. Bureau of Reclamation (BOR) 4-100, 5-28, 5-102
U.S. Department of the Interior (DOI) 7-27
U.S. Department of Transportation (DOT) 2-15, 2-18, 2-19, 2-23, 2-25, 5-25, 5-134, 5-135, 5-136, 5-139, 7-42
U.S. Environmental Protection Agency (EPA) 4-33, 4-134, 4-139, 4-142, 5-23, 5-25, 5-120, 5-125, 5-143, 7-13, 7-21
U.S. Fish and Wildlife Service (FWS) 1-6, 1-12, 4-55, 4-75, 4-76, 5-37, 5-39, 5-51, 5-52, 5-54, 5-58, 5-60, 5-61, 5-63, 5-65, 5-66, 5-68, 5-72, 5-73, 5-74, 7-1, 7-10, 7-11, 7-12, 7-26, 7-27, 7-29, 7-30, 7-32, 7-33, 7-34
U.S. Geological Survey (USGS) 3-40, 3-41, 4-38, 4-108
Valley elderberry longhorn beetle 4-79, 5-65, 5-66, 7-31, 7-32
Valley spearscale 4-81, 4-85, 5-74, 7-36
Vasco Caves 3-35, 4-108, 5-8, 5-102, 6-2
Vernal pool fairy shrimp 4-68, 4-78, 5-37, 5-50, 5-64, 5-65, 5-74, 7-10, 7-29
Vernal pool tadpole shrimp 4-68, 4-78, 5-64, 5-65, 5-74, 7-10, 7-29
Vernal pools 3-55, 4-55, 4-57, 4-58, 4-61, 4-68, 4-78, 4-81, 4-83, 4-84, 5-32, 5-34, 5-37, 5-39, 5-41, 5-45, 5-46, 5-50, 5-64, 5-65, 5-67, 5-68, 5-74, 5-92, 7-9, 7-10, 7-25, 7-26
Water wells 1-9, 2-18
Western pond turtle 4-68, 4-71, 4-82, 5-70, 7-34

BLM LIBRARY
RS 150A BLDG. 50
DENVER FEDERAL CENTER
P.O. BOX 25047
DENVER, CO 80225

OFFICE
DATE RETURNED
(Continued on reverse)

TD 195 .P4 M653 1995 v.1

Mojave pipeline northward expansion project

BLM LIBRARY
RS 150A BLDG. 50
DENVER FEDERAL CENTER
P.O. BOX 25047
DENVER, CO 80225

Photo Credit: Karen Hendricks